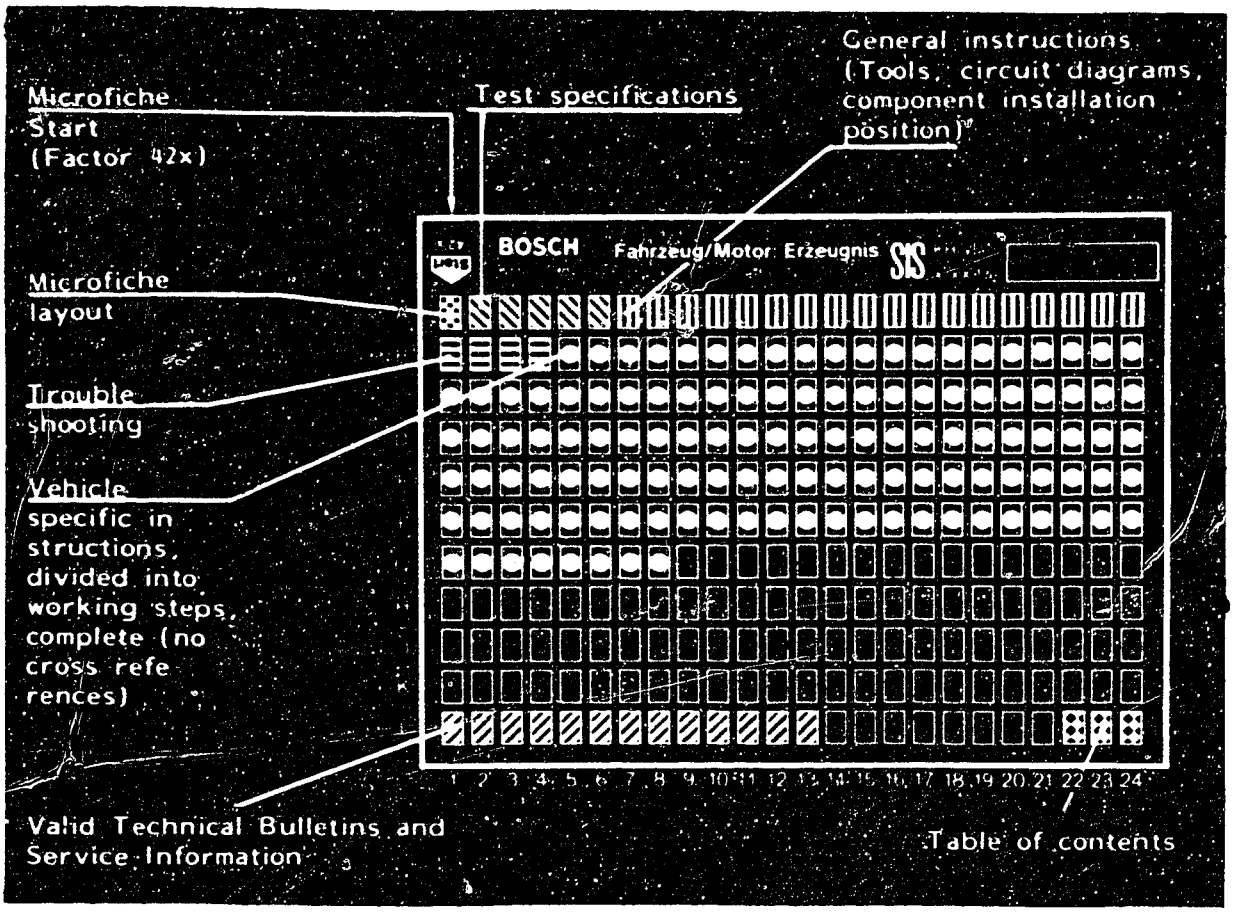
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning | Mid-section | End | One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

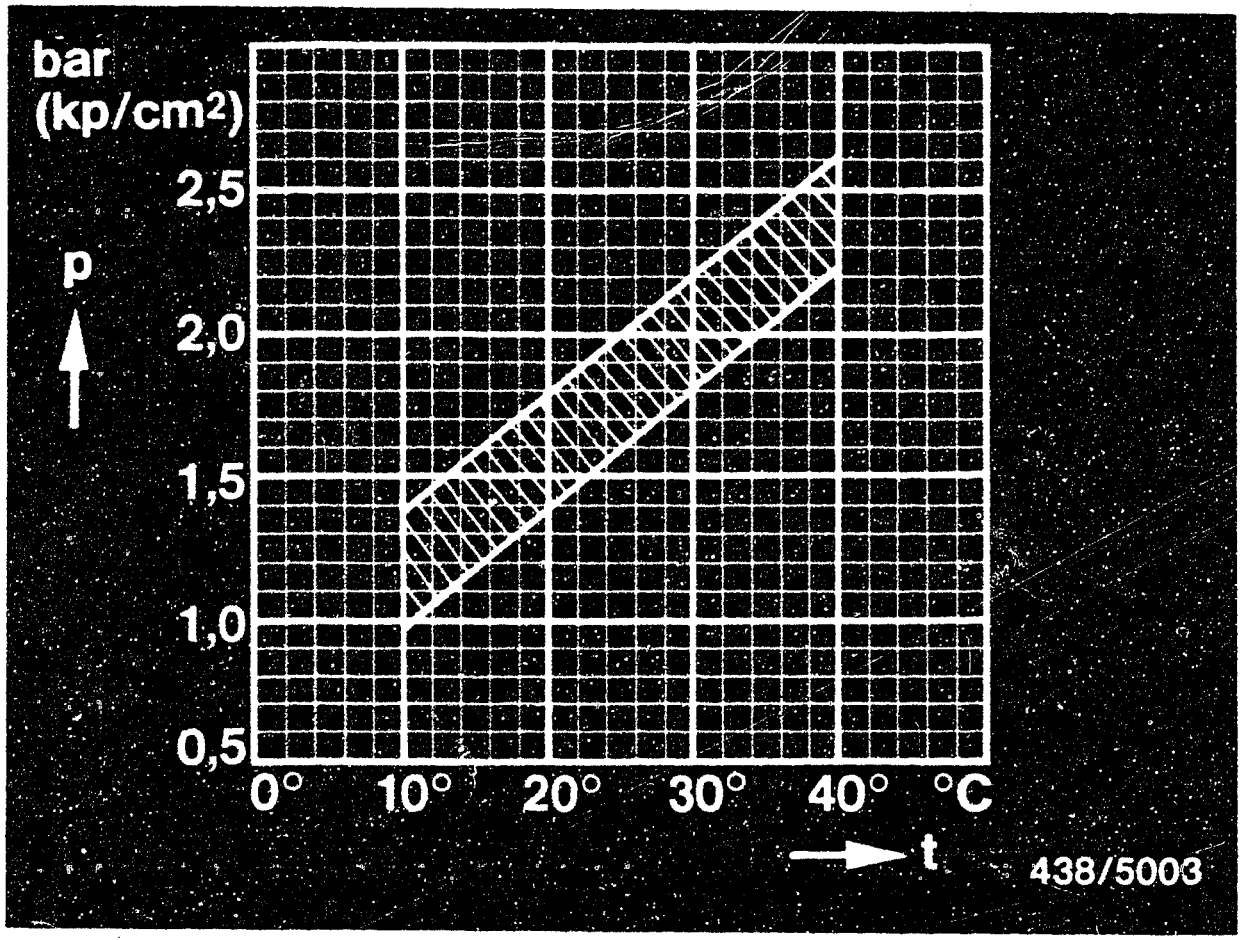
C6

1. Test specifications

1.1 Electric fuel pump

C3

Test step	Test specifications
Fuel delivery	min. 850 cm^3/30 s



p = Control pressure t = Ambient temperature

1.2 Control pressure "cold"

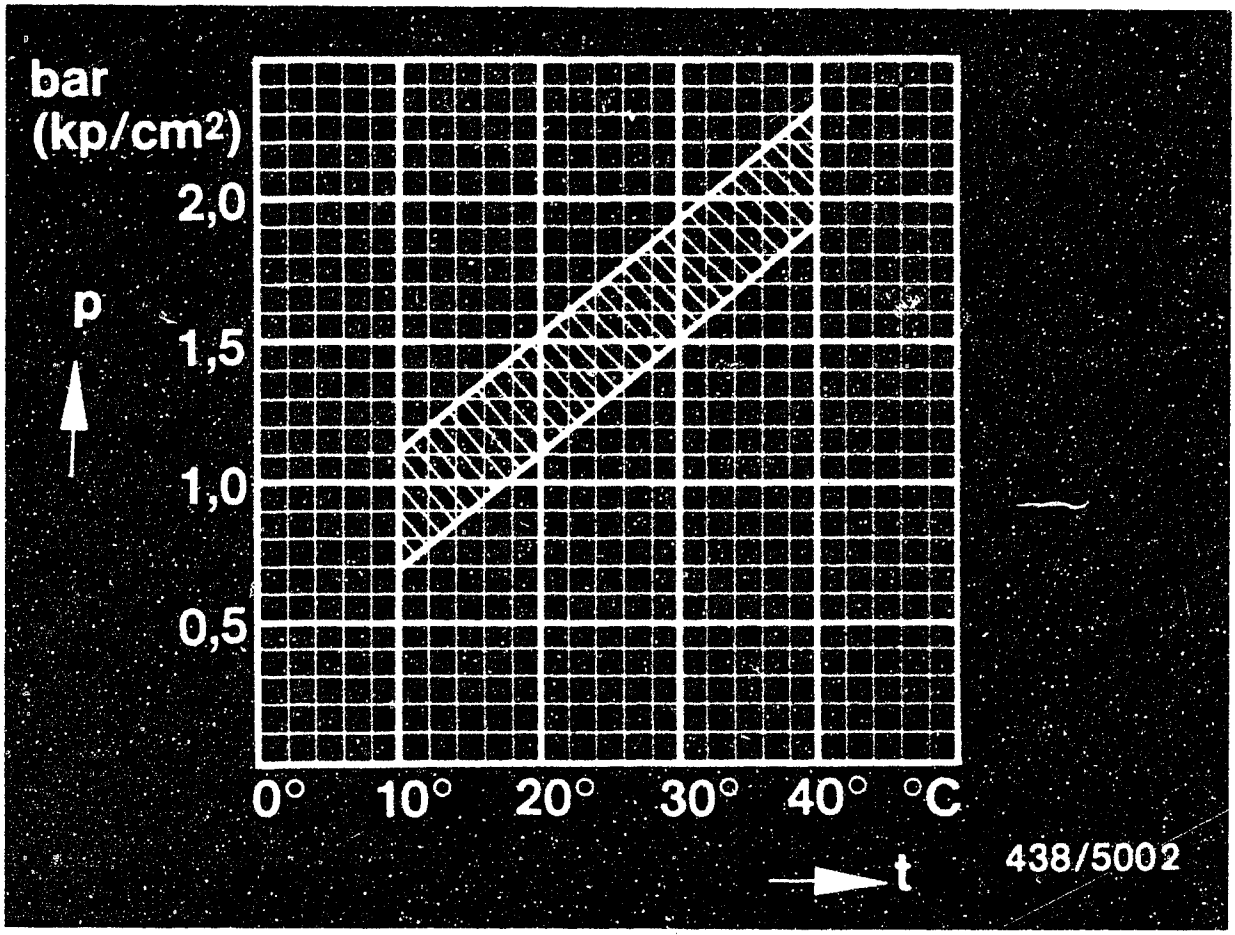
D1

Warm-up regulator part no.: 0 438 140 018

Version for manifold-pressure-dependent full-load enrichment. Installed in engine B 27 E (8.78 - 7.80).

For testing, connect vacuum pump to manifold-pressure connection of warm-up regulator.

Setting value: 500 ... 550 mbar
(375 ... 412 mmHg)



p = Control pressure t = Ambient temperature

Control pressure "cold"

D1

Warm-up regulator part no.: 0 438 140 038

Version for manifold-pressure-dependent full-load enrichment.
Installed in engine B 28 E (8.80 →).

For testing, connect vacuum pump to manifold-pressure connection of warm-up regulator.

Setting value: 500 ... 550 mbar
(375 ... 412 mmHg)

1.3 Control pressure "warm"

Part no. of warm-up regulator: 0 438 140 038, ...018 (version for intake-manifold-pressure-controlled full-load enrichment)

- Test at atmospheric pressure (without vacuum) 3,0...3,4 bar (3,1...3,5 kgf/cm²)

- For testing, connect vacuum pump to intake-manifold connection of warm-up regulator.

  Setting value:
  465...600 mbar
  (350...450 mmHg) 3.4...3.8 bar (3.5...3.9 kgf/cm²)

- Leak test on full-load diaphragm
  Maximum pressure drop
  from setting value: 100 mbar (75 mmHg) / 15 s

* Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm² (gauge pressure).

E1

1.4 Primary pressure (fuel distributor 0 438 100 035)

Checking valve: 4.5...5.2 bar (4.6...5.3 kgf/cm²)

Setting value: 4.7...4.9 bar (4.8...5.0 kgf/cm²)

E9

1.5 Leak test (fuel accumulator 0 438 170 019, ...021)

Minimum pressure
after 10 min: 2.0 bar (2.1 kgf/cm²)
after 20 min: 1.7 bar (1.8 kgf/cm²)

F6

1.6 Injection valves (injection valves 0 437 502 013)

Opening pressure: 2.7...3.8 bar (2.8...3.9 kgf/cm²)

F17

1.7 Fuel distributor (fuel distributor 0 438 100 035)

Comparative measurement of deliveries of outlets	Setting point	Max. allowable delivery
Idle	6.0 cm³/min	6.8 cm³/min
Part load	40.0 cm³/min	44.0 cm³/min
Full load	145.0 cm³/min	160.0 cm³/min

1.8 Idle adjustment*

Note: Engine oil temperature	approx. 80°C

Idle speed

All versions with automatic transmission:	10 min^{-1}
manually-shifted transmission:	900 min^{-1}

CO concentration**

Checking value

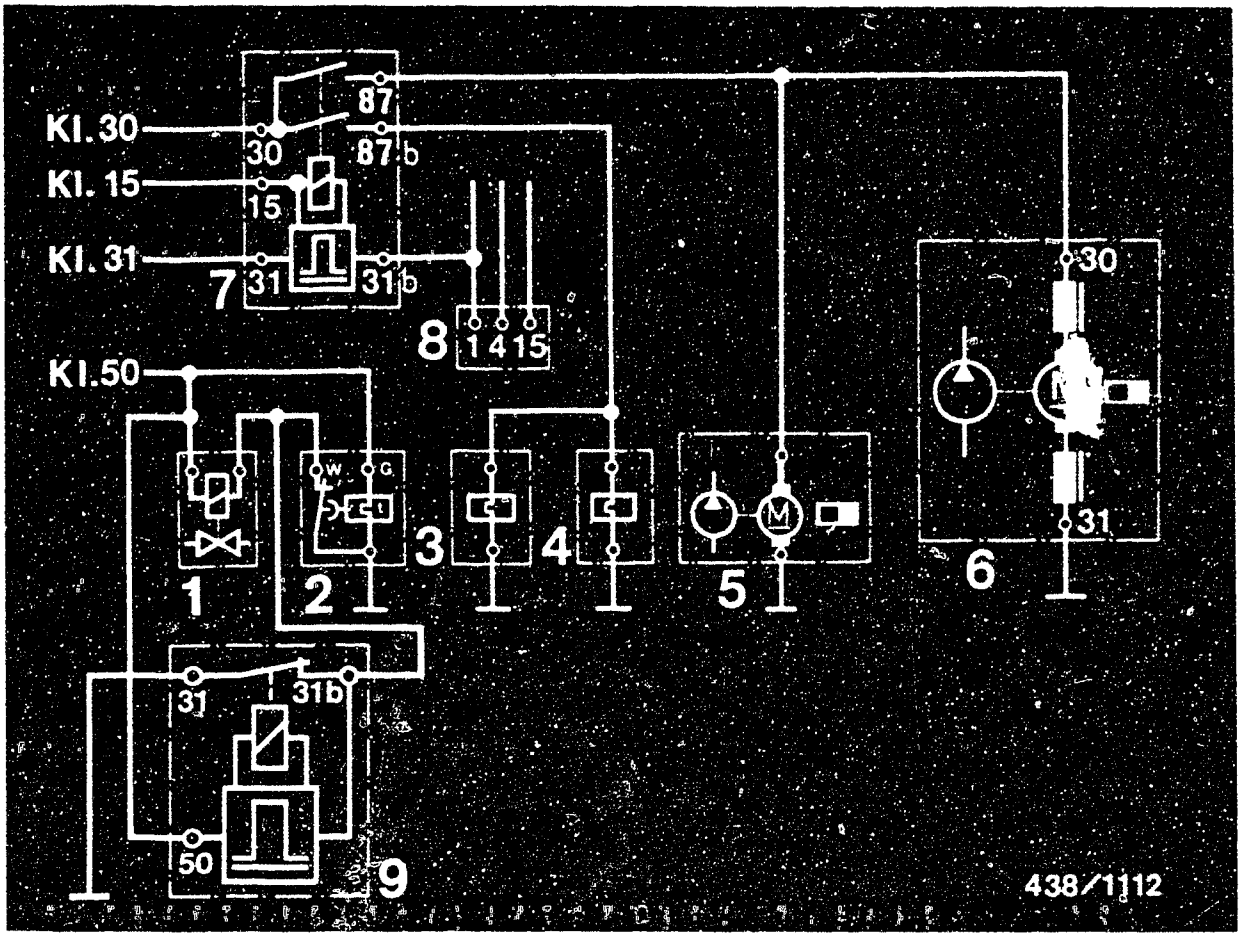
All versions:	1.0...3.0 % by vol. CO

Setting value

All versions:	2.0 % by vol. CO

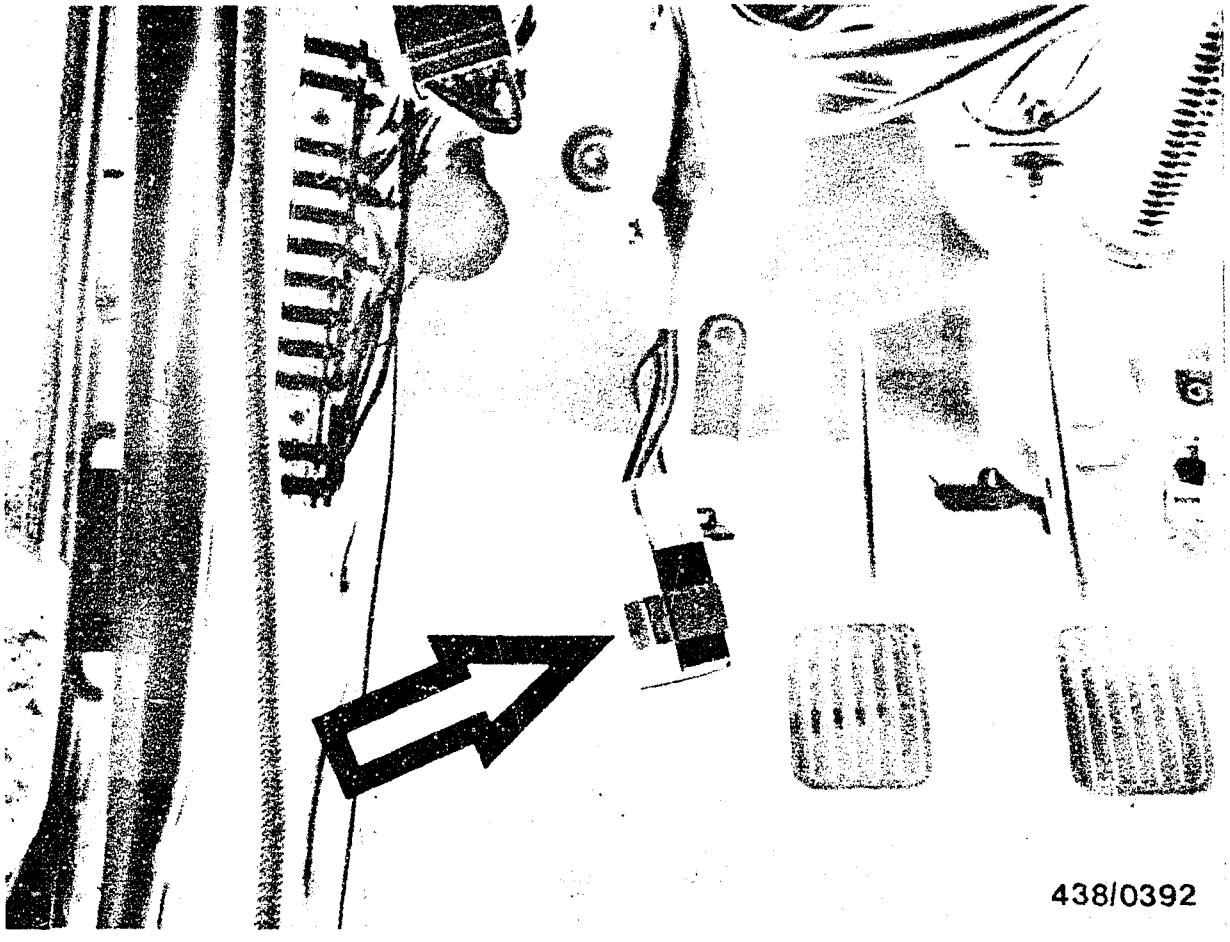
* Notes:
Vehicles of the Sweden and Australia version are equipped with "Pulsair" system. This must be rendered inoperative before checking and setting the idle adjustment: To do this, remove hose between Pulsair valve and air filter on air filter and seal off tight with a plug.

** Engines whose CO concentration is within the checking tolerance do not need to be re-adjusted if otherwise running smoothly.
If the CO concentration is outside the checking tolerance, set to the setting value.



1 = Start valve
2 = Thermo-time switch
3 = Warm-up regulator
4 = Auxiliary-air device
5 = Fuel pre-supply pump
6 = Electric fuel pump
7 = Electronic engine-speed relay (pump relay)
8 = Ignition coil
9 = Time-pulse relay for hot-starting (B 28 E only)

2. Electrical safety circuit



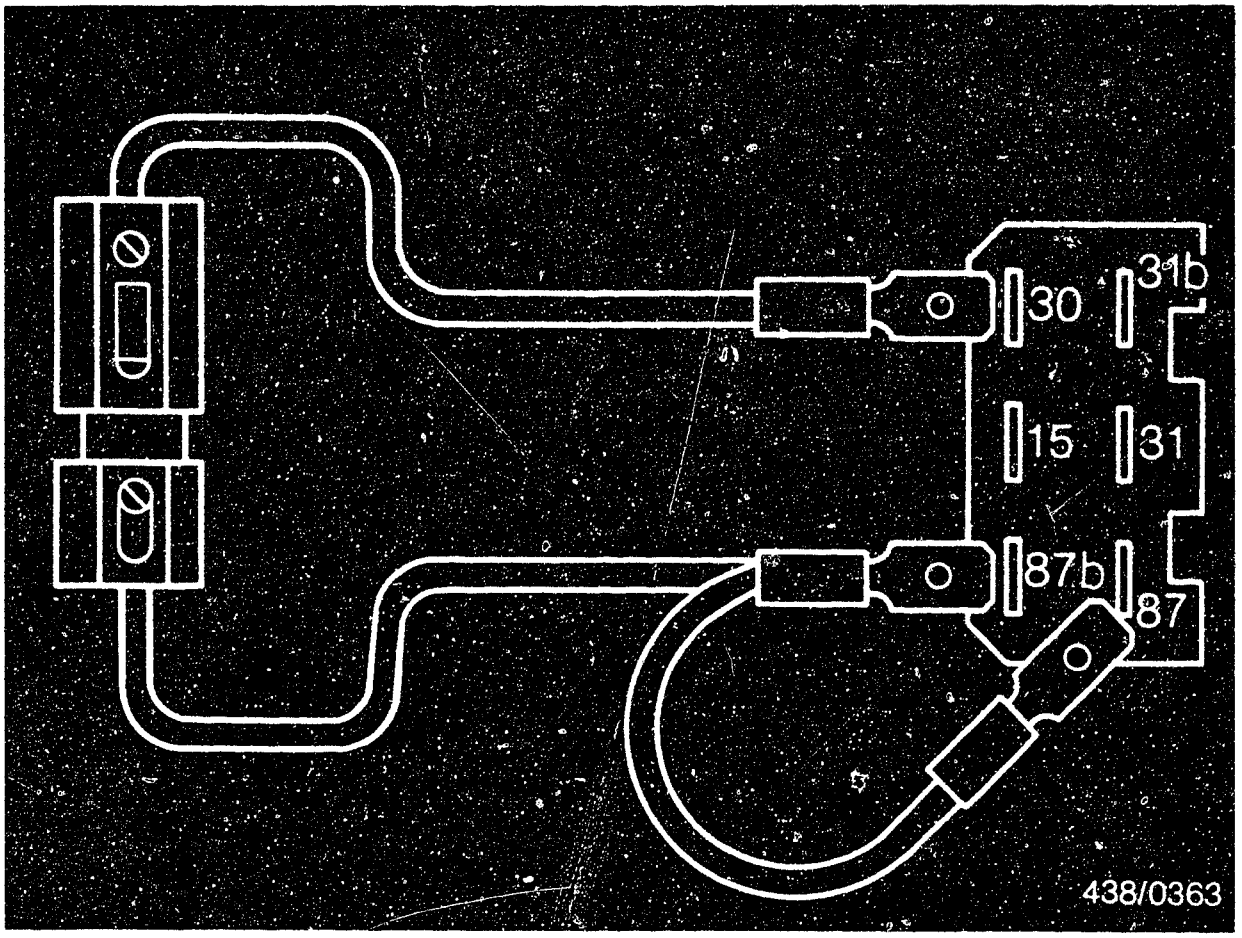
438/0392

2.2 Bridging the safety circuit

In order to carry out testing with the engine stationary, it is necessary to bridge the safety circuit.

The relay (arrow) is fastened on a mounting piece left of the steering column under the instrument panel (picture shows relay removed from its mounting). Remove the relay in order to bridge the safety circuit.

The relay is made accessible by removing the left-hand underside trim of the instrument panel and the left-hand side trim in the footwell.



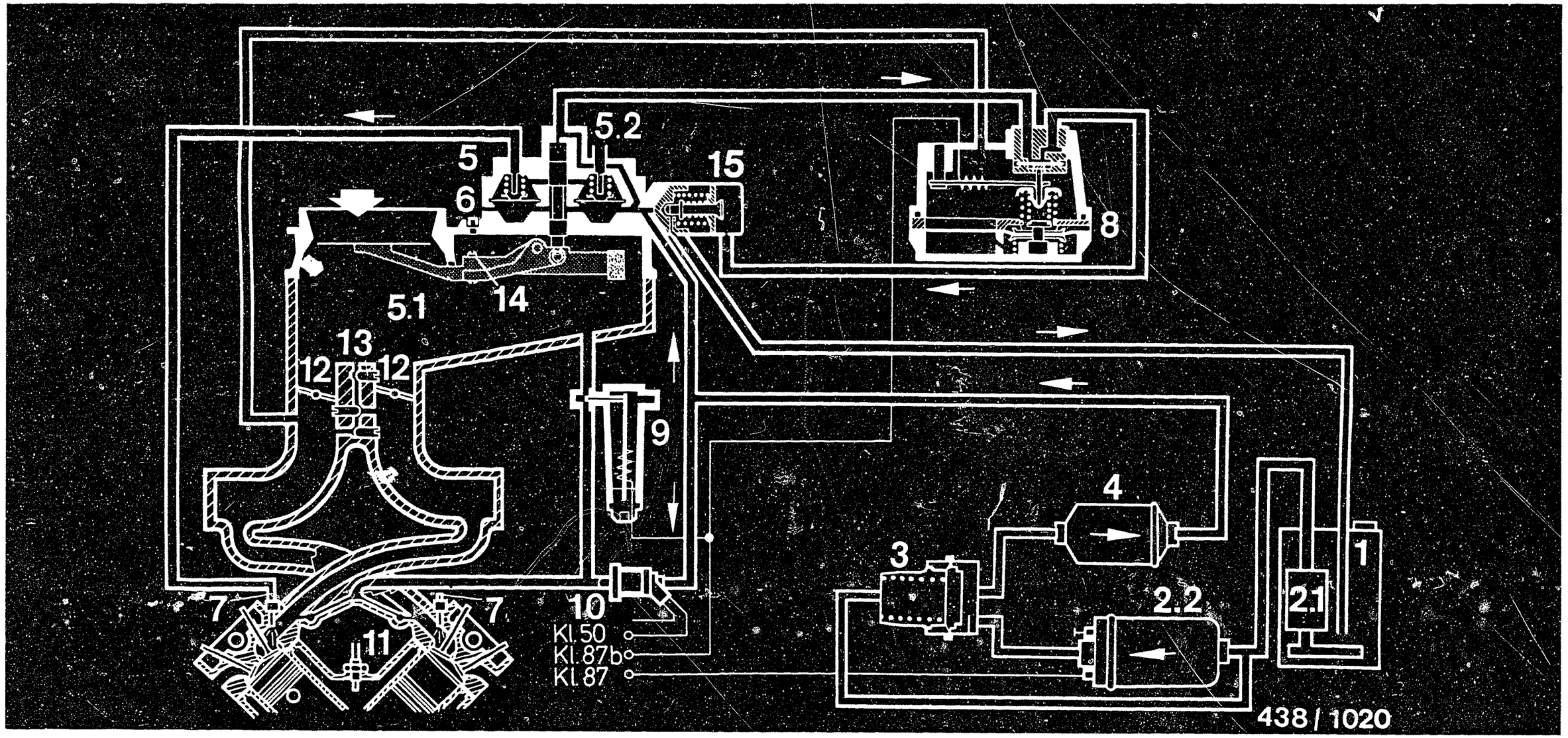
Bridging the safety circuit for testing:

Connect contacts 87 and 87b with contact 30 in the base with a twin bridge.
Use connecting cable 1.5 mm² with fuse holder and 16 A fuse.

Electric fuel pump, pre-supply pump, warm-up regulator and auxiliary-air device are now supplied with battery voltage.

C A U T I O N !

Never depress (deflect) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.



1 = Fuel tank
2.1 = Pre-supply pump
2.2 = Electric fuel pump
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Air-flow sensor
5.2 = Fuel distributor
6 = Anti-tamper cap
7 = Injection valve
8 = Warm-up regulator
9 = Auxiliary-air device
10 = Start valve
11 = Thermo-time switch
12 = Throttle valve
13 = Idle-speed screw (bypass)
14 = Idle-mixture-adjusting screw
15 = Primary-pressure regulator with push valve

3. Diagram of fuel lines

4. General information

4.1 Introduction

This repair instruction manual refers to the Volvo vehicle model 260.. with the engine versions B 27 E and B 28 E as of model year 1979.

The manual gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.

All the system components are dealt with in separate working steps with the corresponding test specifications.

In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 1 - B 4 is intended to make it easier to decide which test steps have to be carried out for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column refers to the appropriate test step with the associated test specification.

Important note:

If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.

C A U T I O N !

During testing, never depress (deflect) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected through the injection valves. When the engine is subsequently started this may lead to serious engine damage.

Ensure utmost cleanliness when working on the K-Jetronic. Clean the outside of fuel connections thoroughly before loosening.

4.2 Design of the K-Jetronic:

The entire system of the K-Jetronic in the Volvo 260.. corresponds to the basic version described in Technical Instruction VDT-U 3/1.

An additional component is the fuel pre-supply pump (not made by Bosch) which is installed in the fuel tank. When testing the electric fuel pump (testing the fuel delivery), bear in mind the possible influence of the pre-supply pump.

4.3 Electrical safety circuit:

As in the other Volvo models, the electrical safety circuit employs an electronic rotational-speed relay.

The B 28 E engine also additionally has the time-pulse relay for hot-starting enrichment through the start valve. With the thermo-time switch open, i.e. at engine temperatures above 35°C, fuel is injected intermittently through the start valve when the starting motor is operated. The first pulse begins 1.5 sec after the start of cranking.

4.4 Other equipment

The B 27 E engine in vehicles of the Sweden and Australia version is equipped with exhaust-gas recirculation (EGR), and the B 28 E engine is equipped with the "pulsair" secondary-air system.

With exhaust-gas recirculation, some of the exhaust gas is returned from the exhaust system to the intake system in order to take part once again in combustion. This reduces the proportion of nitrogen oxides (NO_x) in the exhaust gas. Exhaust-gas recirculation is inoperative when the engine is cold and when the engine is idling.

With the Puls-air system unburned gases in the exhaust are afterburned by the injection of air, likewise resulting in a reduction of pollutants in the exhaust gas.

The system does not employ a secondary-air pump, but uses the pulsation in the alternation between overpressure and depression in the exhaust system. When there is a depression, auxiliary air is drawn into the exhaust manifold. When there is overpressure, non-return valves prevent the exhaust gas from flowing back to the air filter.

5. Test equipment and tools

- Pressure tester KDJE-P 100 (previously KDEP 1034)

For testing all fuel pressures and testing for leaks.

- Connecting-parts set KDJE-P 100/10 (previously KDEP 1034/10)

For connecting pressure tester KDJE-P 100 (previously 1034/10) to the control-pressure port of the fuel distributor.

- Adjusting wrench KDEP 1035

For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO-adjustment).

- Guide ring KDEP 1040/13 (85 mm dia.)

For centering the air-flow sensor plate in the air-flow sensor.

- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451)

For comparing the fuel delivered from the individual fuel-distributor outlets.

- Electric connecting cable (test lead)

KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.

- Graduate (commercially available, capacity approx. 1.5 l)

For measuring the delivery of the electric fuel pump.

- Valve tester KDJE-P 400 (previously KDJE 7452).

For testing the injection valves.

Test media: Bosch, Part Designation 14 942-CH
Previously Part No. 5 973 340 650
The Bosch calibrating fluid can be obtained in 5 l metal cans from the following supplier:

Firma
Oskar Gnamm GmbH
D-7531 Kämfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

- Air-flow sensor plate adjusting device KDJE 7456

  For deflecting and setting the air-flow sensor plate (downdraft air-flow sensor) when testing the fuel distributor (comparative measurement of deliveries).

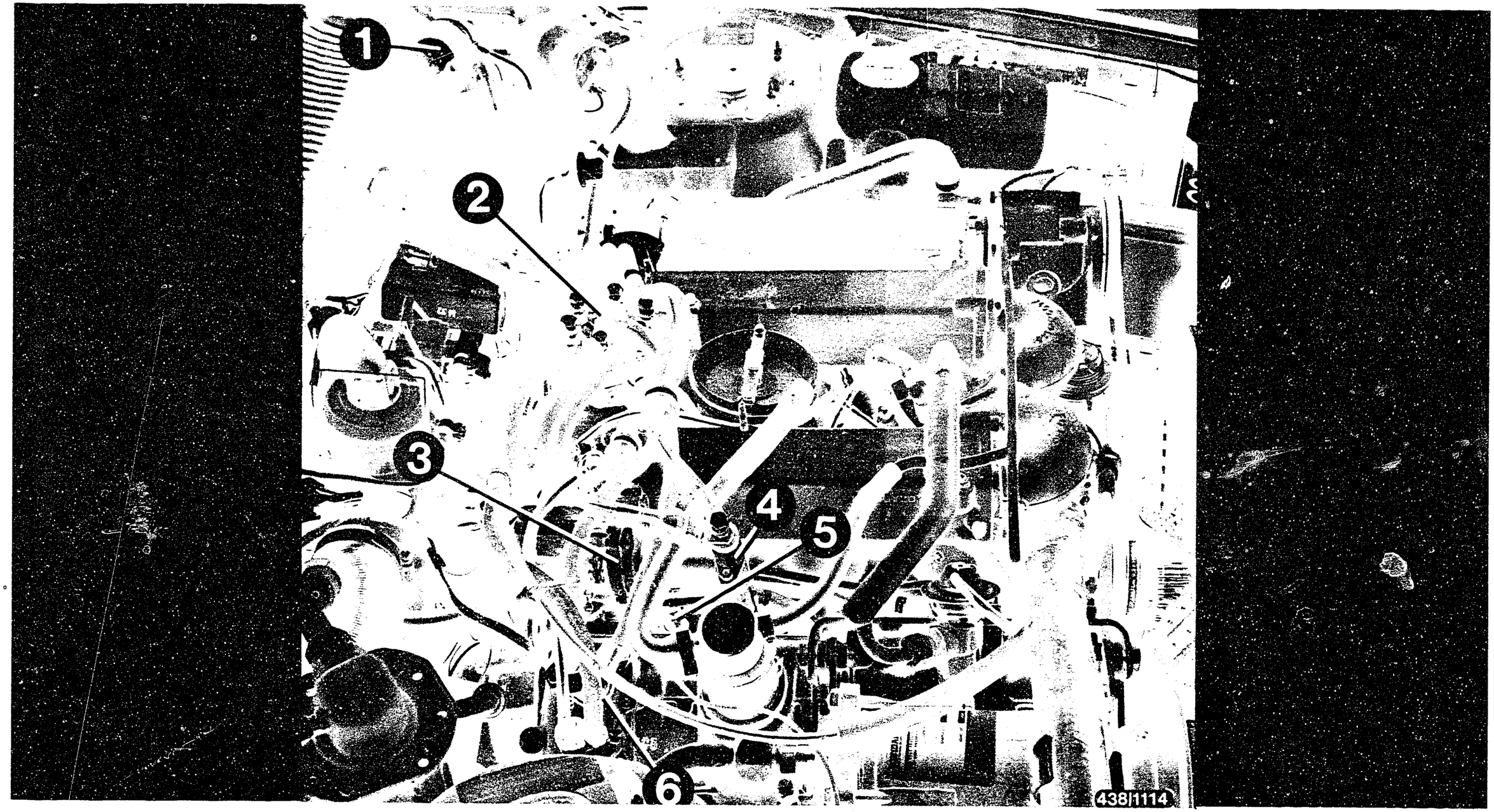
- Tachometer (commercially available)

  For idle-speed adjustment

- CO meter (commercially available)

  For idle-speed CO adjustment.

- Set of tools for the removal and fitting of idle-CO-anti-tamper-device of air-flow sensor. (e.g. No. 4521/7 form the firm Hazet, D-5630 Remscheid).

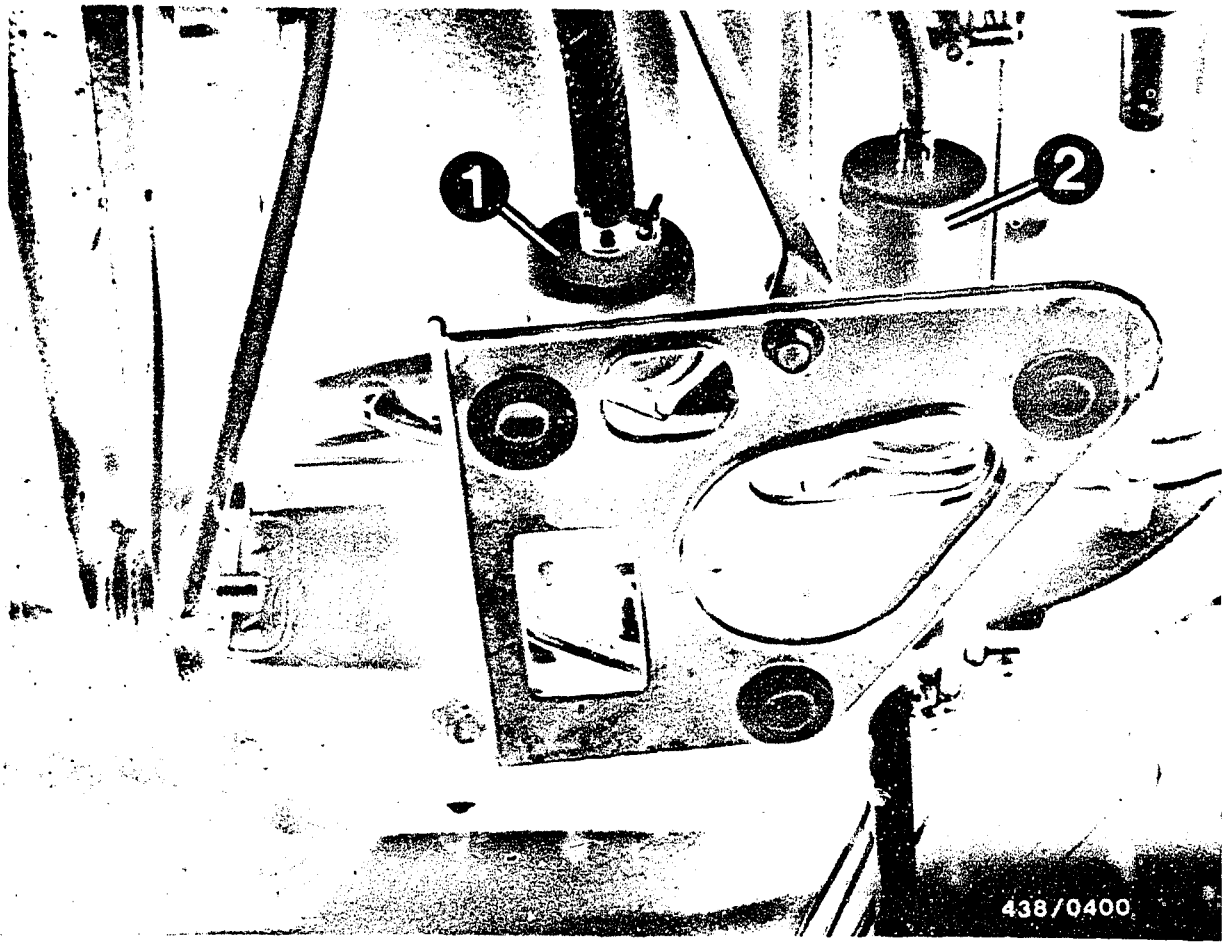


1 = Fuel filter
2 = Mixture-control unit
3 = Auxiliary-air device
4 = Start valve
5 = Injection valve (others concealed)
6 = Warm-up regulator

The thermo-time switch is under the junction of the intake tubes in the region of the coolant thermostat.

6. Installation position of individual components

6.1 Arrangement of components on engine (air filter removed)

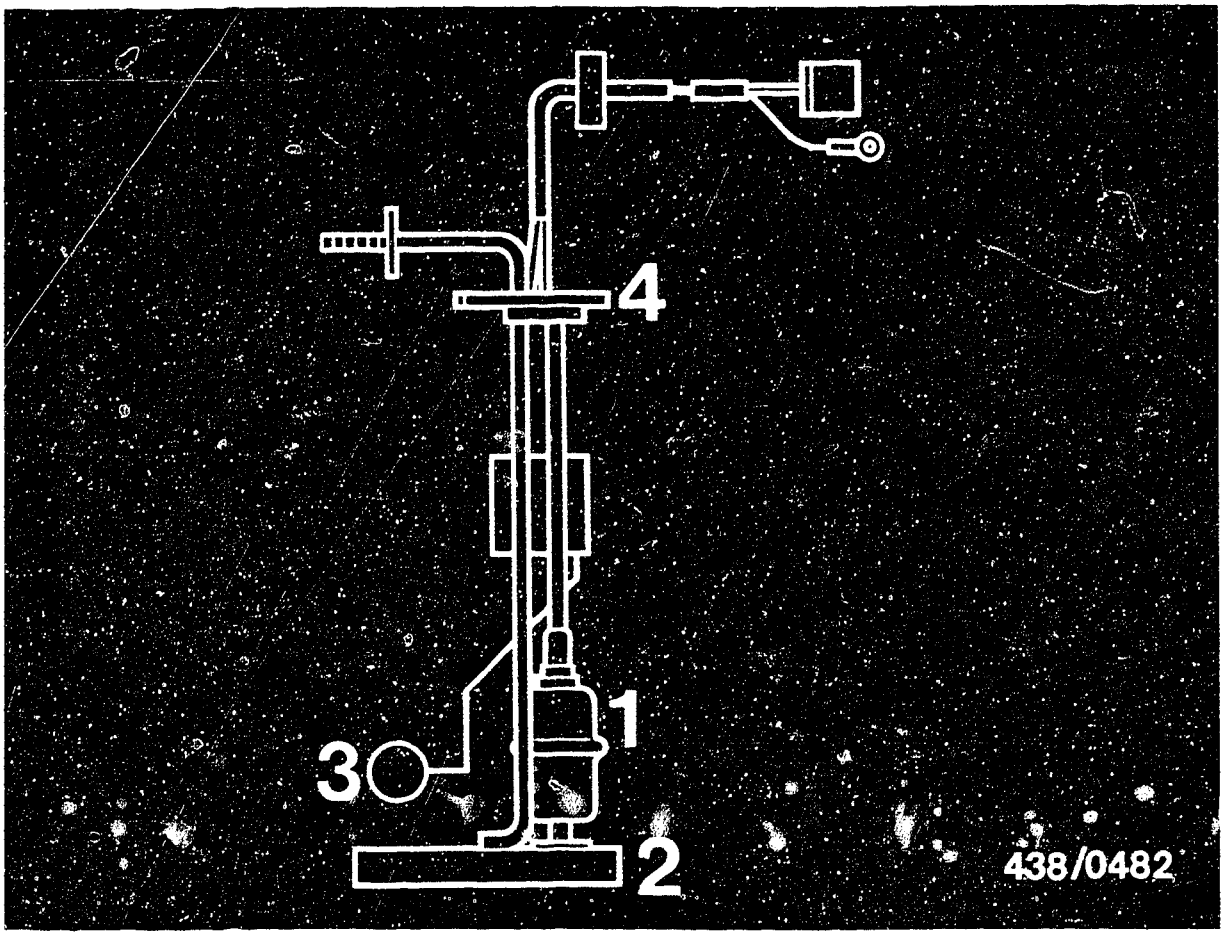


1 = Electric fuel pump 2 = Fuel accumulator

Located on the floor of the vehicle (on the left-hand side as viewed from behind the vehicle) in front of the rear axle is a bracket on which are mounted the electric fuel pump (1) and the fuel accumulator (2).

Up to 1979 model, the Volvo vehicles were equipped with electric fuel pump Type EKP I (with side delivery fitting).

As of the 1980 model, the Volvo models are equipped with electric fuel pumps of Type EKP IV (intake and delivery fittings central in the longitudinal direction of the pump).



1 = Pre-supply pump
2 = Intake filter
3 = Float for fuel-level pickup
4 = Fastening flange

The pre-supply pump installed in the Volvo (not made by Bosch) is combined into one unit with the pickup for indicating the fuel level. The pickup is made accessible by removing the luggage-compartment mat and the small cover fastened by two screws.

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 2 - B 5 is intended to make it easier to decide which test steps have to be carried out for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column refers to the appropriate test step with the associated test specification.

Important note:

If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

Trouble-shooting chart (see also Coordinates (B 4/B 5)

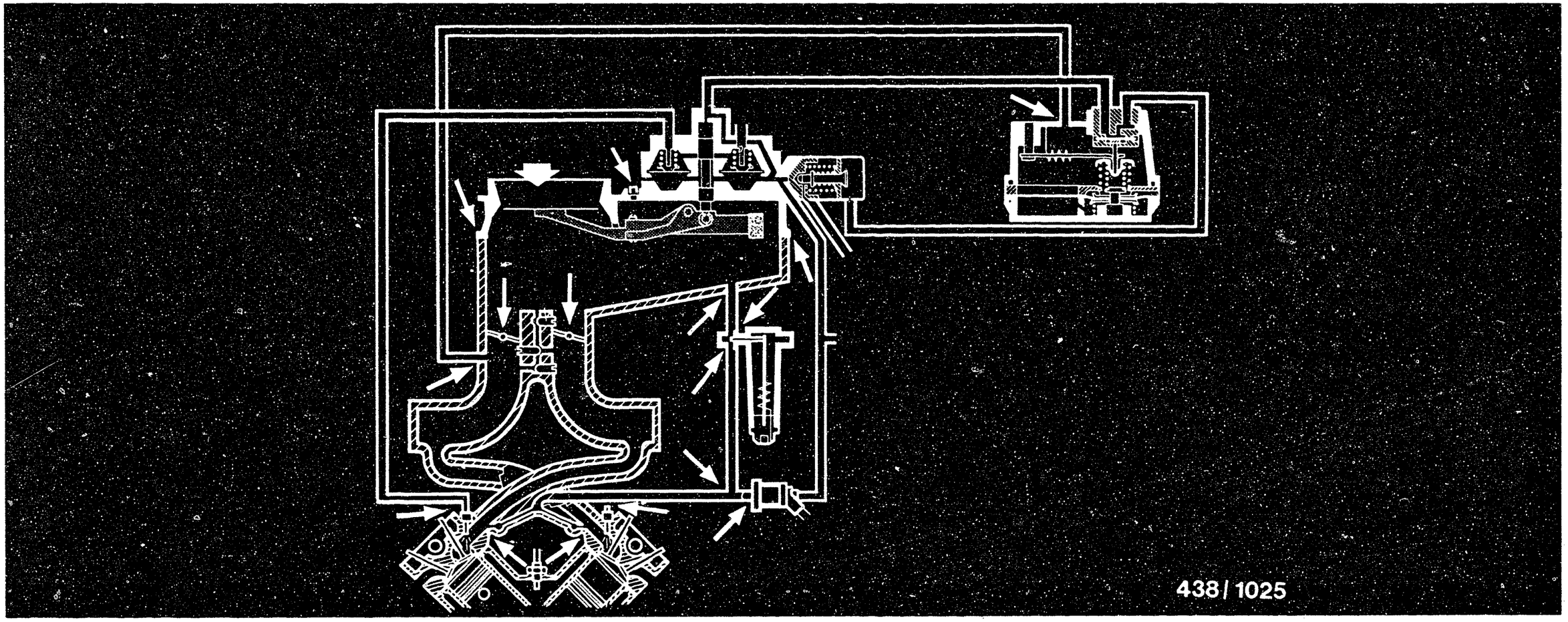
Customer complaint (fault symptom)

1. Engine does not start, or starts poorly, in cold condition	2. Engine does not start, or starts poorly in warm condition*)	3. Irregular idling during the warm-up phase (shakes)	4. Irregular idling with warm engine (shakes)	5. Engine does not draw gas, burbles	6. Engine misfires when operating on the road, high load	7. Insufficient power	Cause	Coordinates
	●	●	●	●		●	Vacuum system leaking	B 6
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 8
	●						Position of the air-flow sensor plate incorrect	B 17
●		●					Auxiliary-air device does not open	C 1
●	●				●		Electric fuel pump not operating	C 3
●							Cold-start system defective	C 16
		●	●				Cold-start valve leaking	C 16
				●			Excessive fuel delivery for control-pressure circuit	D 3
●		●					"Cold" control pressure outside tolerance	D 1
			●	●	●	●	"Warm" control pressure too high (after warm-up)	D 1
			●	●		●	"Warm" control pressure too low (after warm-up)	D 1
					●	●	Primary (system) pressure outside tolerance	E 1
	●						Overall fuel system leaking	E 9
●	●	●	●		●		Injection valves leaking, opening pressure too low	F 6
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	F 17
●	●	●	●	●			Basic idle adjustment incorrect	G 7
						●	Throttle plate does not open completely	----
	●						Time-pulse relay for improved hot starting defective (B 28 E only)	A 15

* Note:
If, in the case of Symptom 2, after checking and repairing all the fault causes listed below, the hot-start characteristic is still unsatisfactory this can be improved by fitting an impulse relay.
The fitting of this relay is described in Coordinates L 5.

Customer complaint (fault symptom) (continued)

8. Engine runs on after being switched off ("diesels")	9. Fuel consumption too high	10. Flat spot during acceleration	11. CO concentration during idling too high	12. CO concentration during idling too low	13. Idle-speed cannot be adjusted (too high)	14. Engine starts but then immediately stops	Cause	Coordinates
		•		•			Vaccuum system leaking	B 6
•		•	•	•			Air-flow sensor and/or control plunger not moving smoothly	B 8
•							Position of the air-flow sensor plate incorrect	B 17
					•		Auxiliary-air device does not close	C 1
						•	Electric fuel pump not operating	C 3
•	•		•				Cold-start valve leaking	C 16
		•				•	Excessive fuel delivery for control-pressure circuit	D 3
		•				•	"Warm" control pressure too high (after warm-up)	D 1
	•	•	•			•	"Warm" control pressure too low (after warm-up)	D 1
		•				•	Primary (system) pressure outsinde tolerance	E 1
•							Injection valves leaking, opening pressure too low	F 6
		•					Unequal fuel delivery (imbalance of fuel delivery)	F 17
•	•	•	•	•			Basic idle adjustment incorrect	G 17



Working steps

8. Check the air-intake system of the engine for leaks.

The arrows in the diagram show typical points where leaks can occur.
Check by performing a visual inspection or, in cases of doubt, as follows: Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intake system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water, or spray with leak detector (e.g. Güpoflex).

Under no circumstances may combustible liquids be used when testing for leaks.
The formation of bubbles or foam indicates a leak.
If a leak has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature:
Idle-speed adjustment is described on Coordinates G 7.

B6 Leak test on air-intake system
Volvo model 260..

B7 Leak test on air-intake system
Volvo model 260..

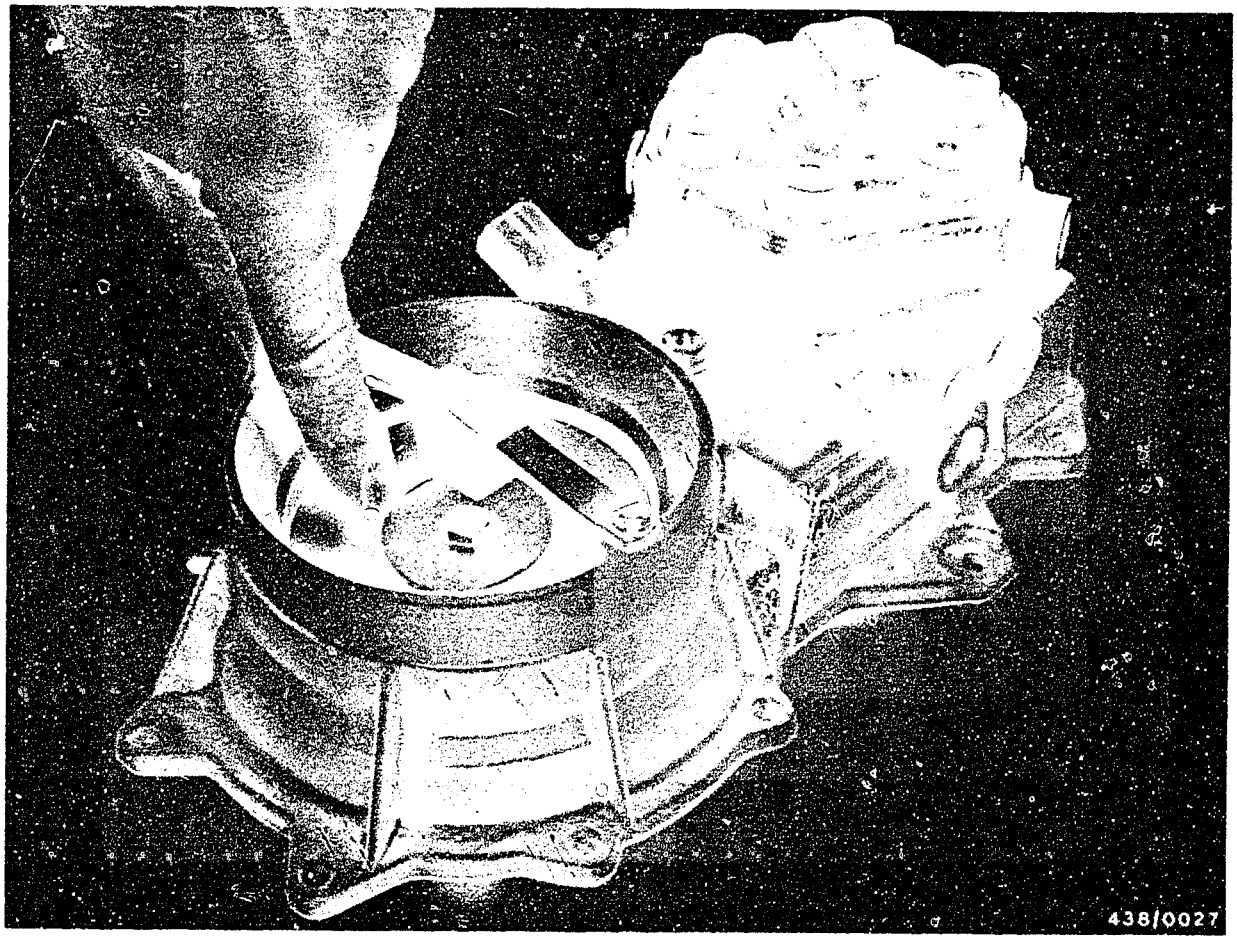
9. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

9.1 Preparations

- Engine temperature not below +20°C.
- Remove air filter connecting dome so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
  This results in application of the control pressure to the control plunger in the fuel distributor.

C A U T I O N !

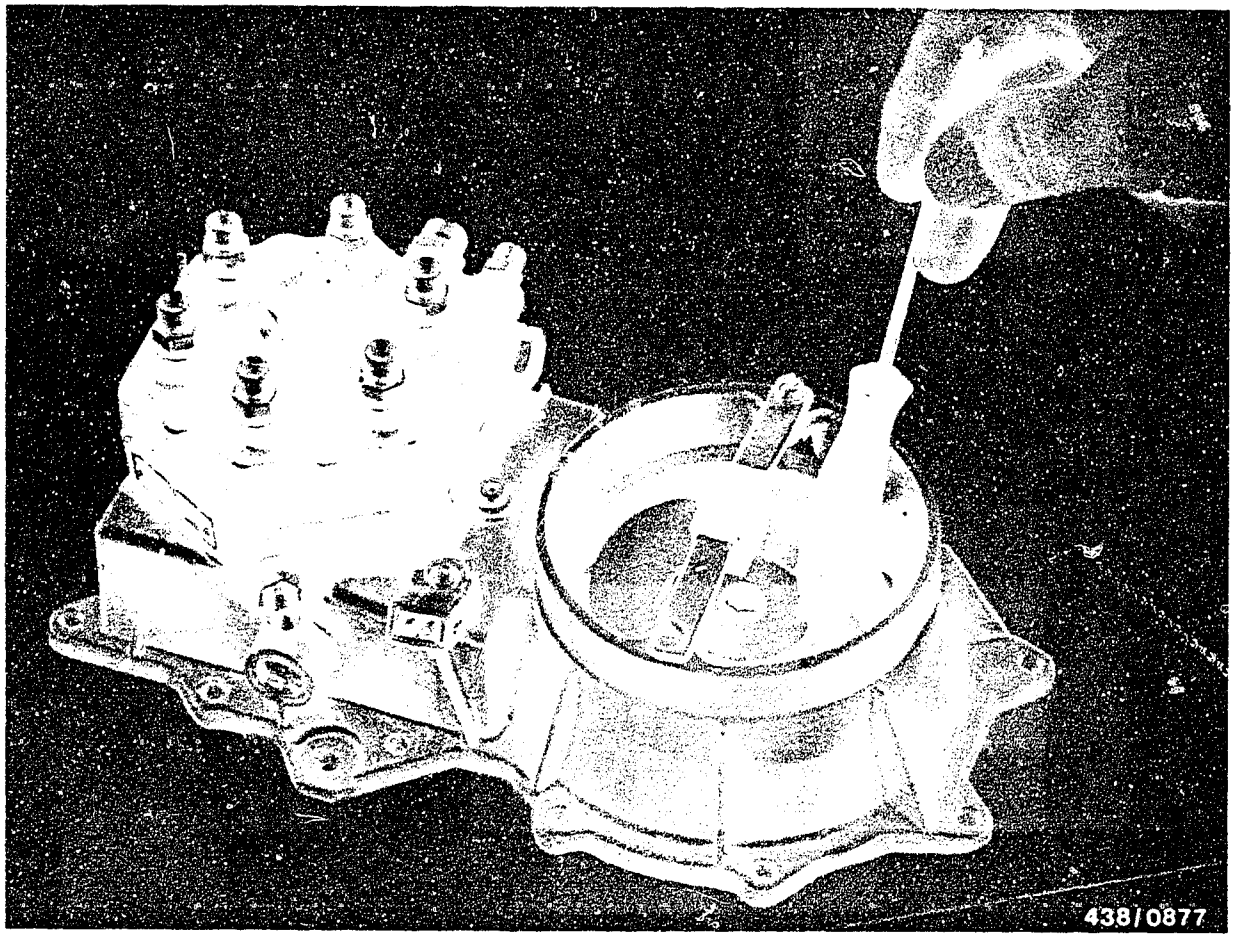
During testing, never depress (deflect) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected through the injection valves. When the engine is subsequently started this may lead to serious engine damage.



9.2 Check that the control lever moves freely

Depress air-flow sensor plate by hand (downdraft) and release. The air-flow sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever does not move freely, first of all release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.

If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (Volvo parts).
Tighten the screws uniformly cross-wise to a torque of 9...10 Nm (0.9...1.0 kgfm).
If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



9.3 Check that the control plunger moves freely

Depress the air-flow sensor plate by hand. The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows only sluggishly, but must make noticeable contact with the sensor plate lever. If this condition is fulfilled, the control plunger can be considered to move freely.

If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

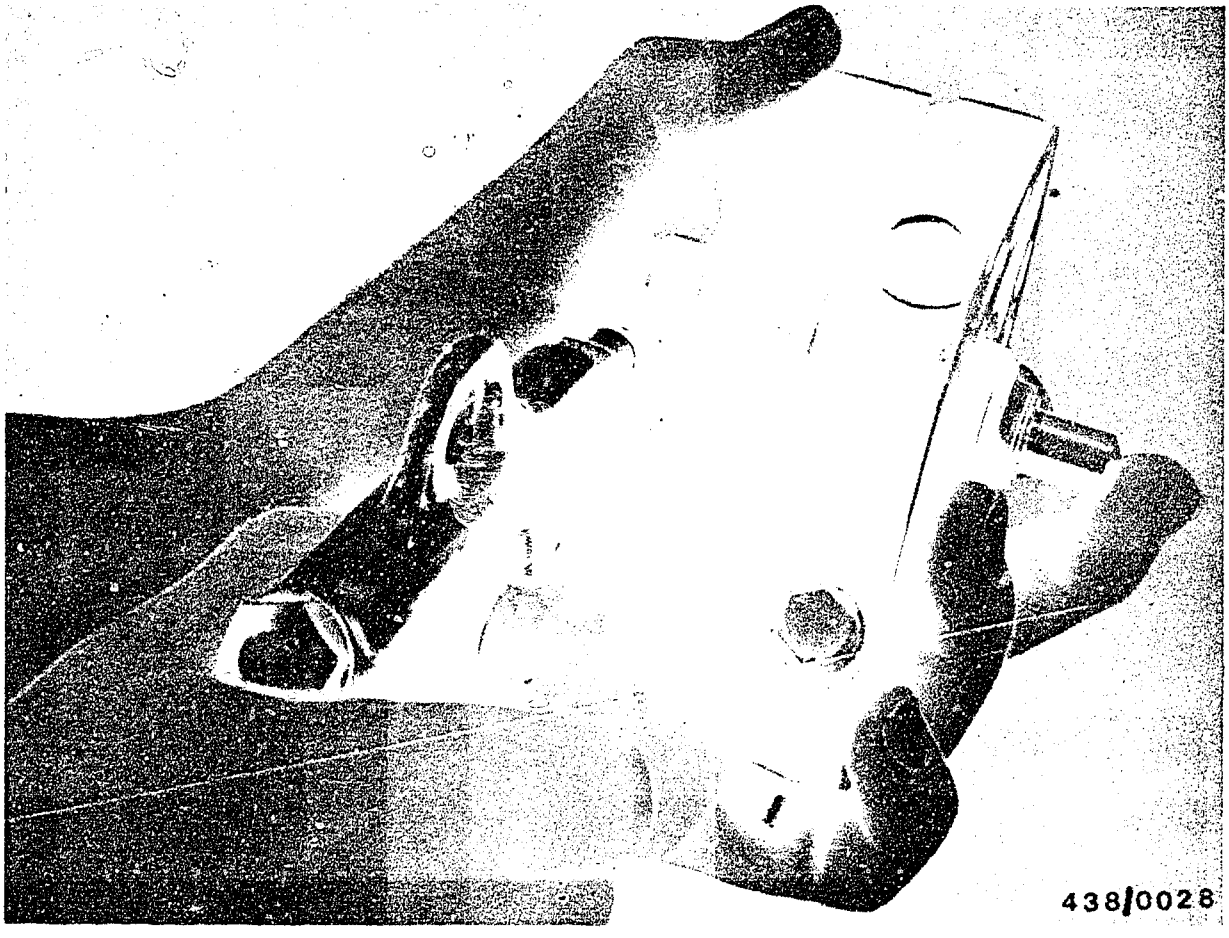
Important!

Note the following when installing fuel components and fuel lines:

Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.

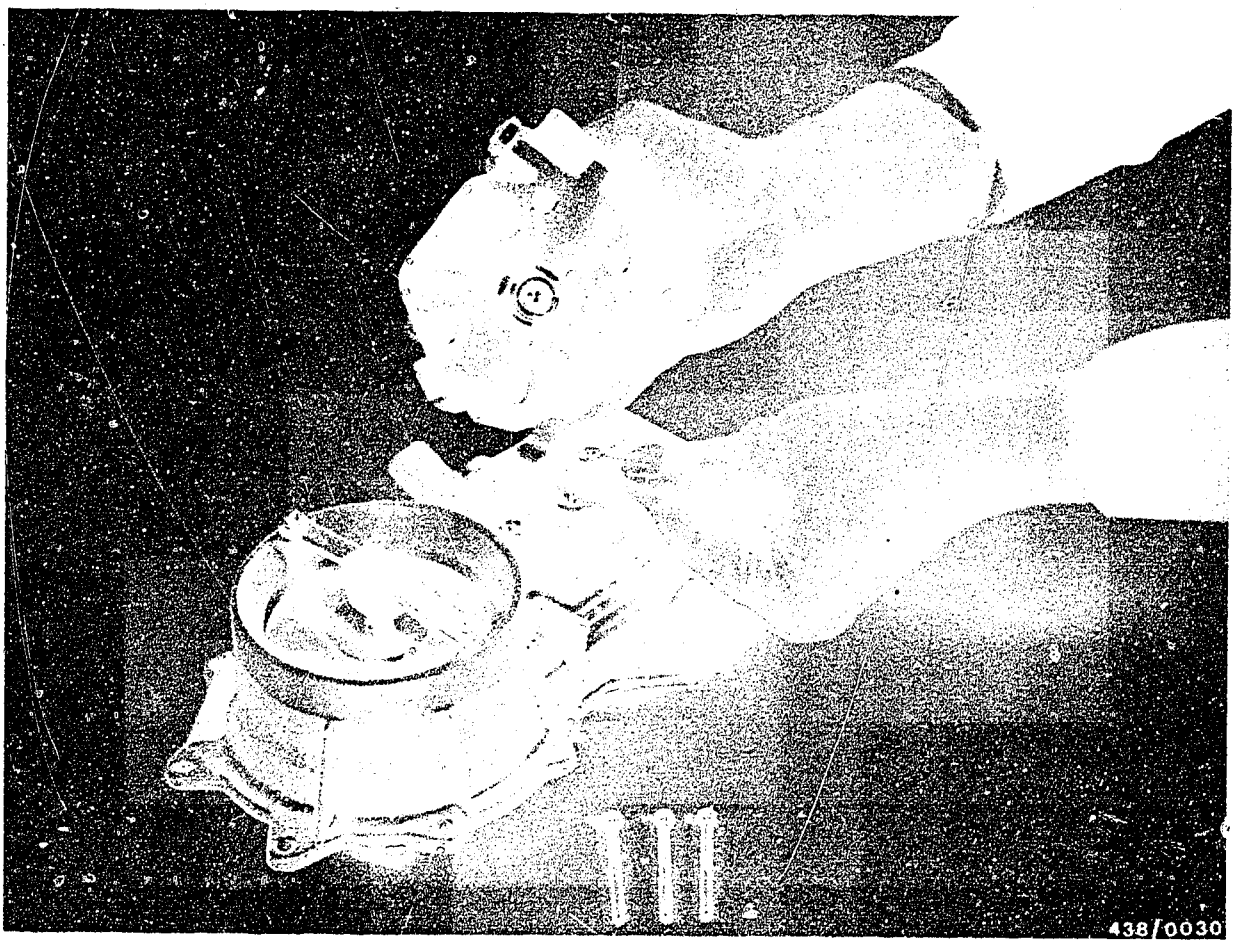
When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.

Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.



Screw out three fastening screws and remove the fuel distributor from the air-flow sensor.

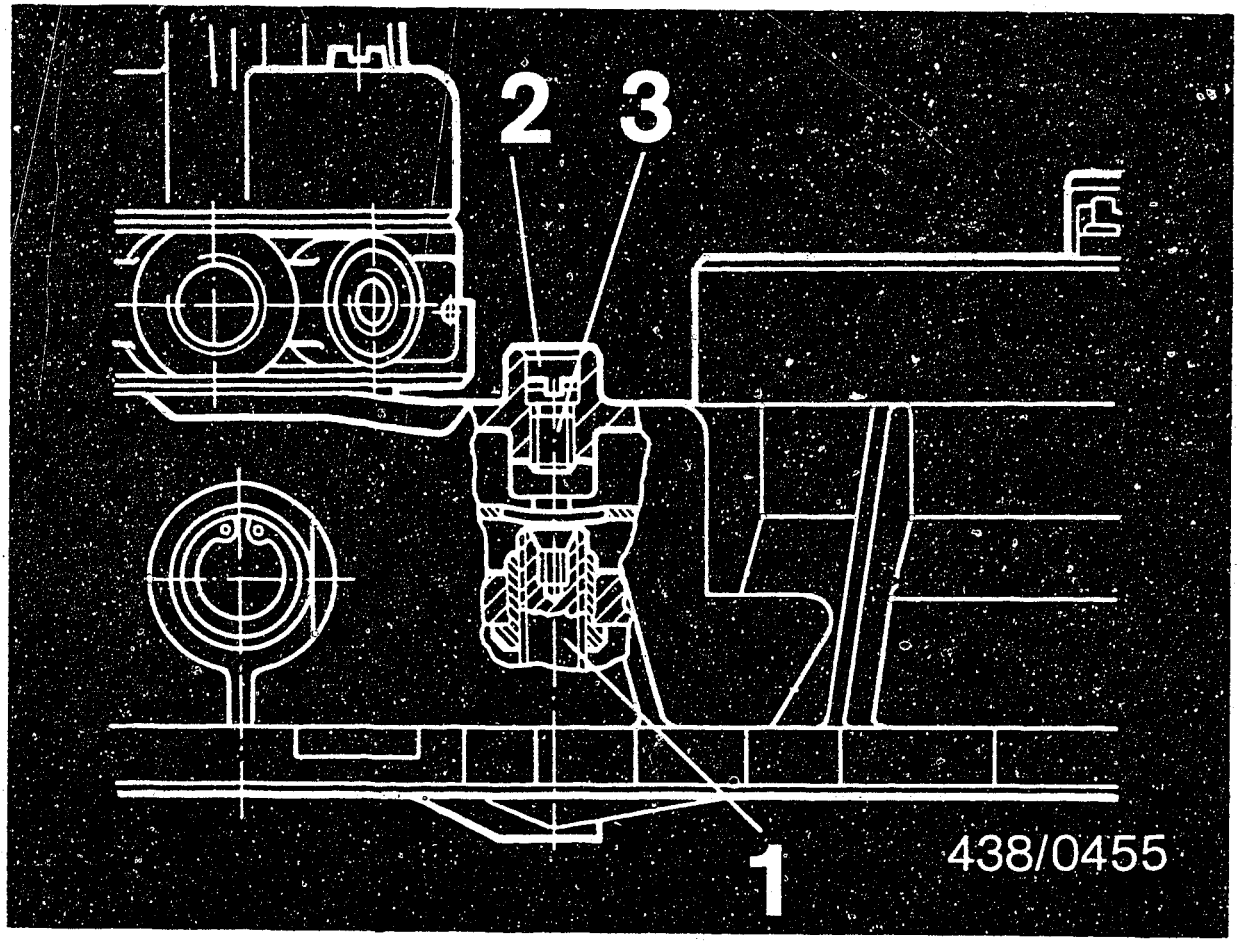
Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor.



9.4 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor. Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.

When connecting the fuel-injection tubing, use new seal rings.

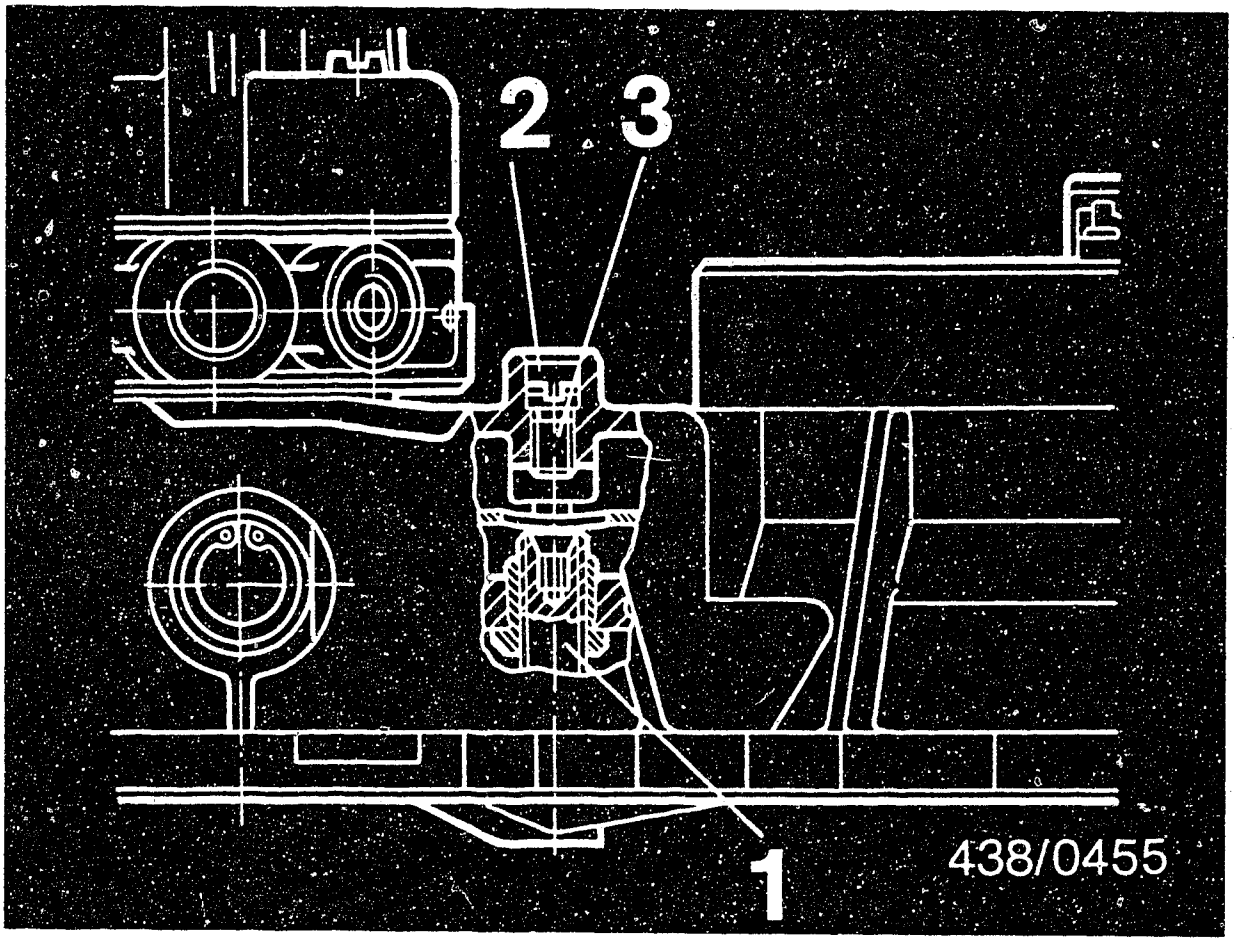


1 = Idle-mixture-adjusting screw
2 = Lead seal
3 = Screw plug

9.5 Matching the fuel distributor to the air-flow sensor for initial starting

Screw off one fuel-injection line from the fuel distributor.
Bridge the electrical safety circuit so that the electric fuel pump operates.

The bore to the idle-mixture-adjusting screw (1) is sealed by a screw plug (3) and an anti-tamper device (lead seal) (2).



1 = Idle-mixture-adjusting screw

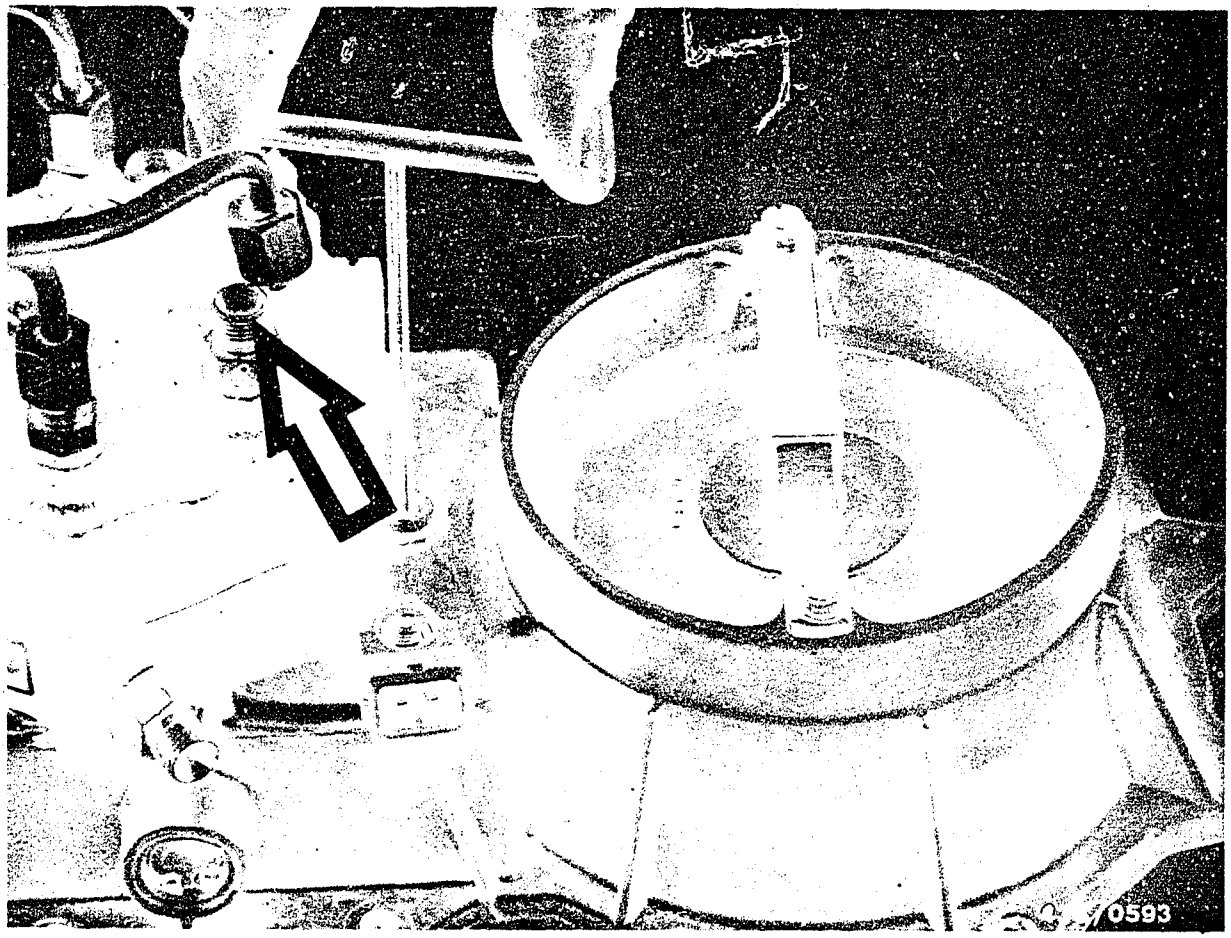
2 = Lead seal

3 = Screw plug

Remove anti-tamper device and remove screw plug. Insert the adjusting wrench KDEP 1035 into the idle-mixture-adjusting screw through the bore.

C A U T I O N !

During testing, never depress (deflect) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected through the injection valves. When the engine is subsequently started this may lead to serious engine damage.



Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the idle-mixture screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

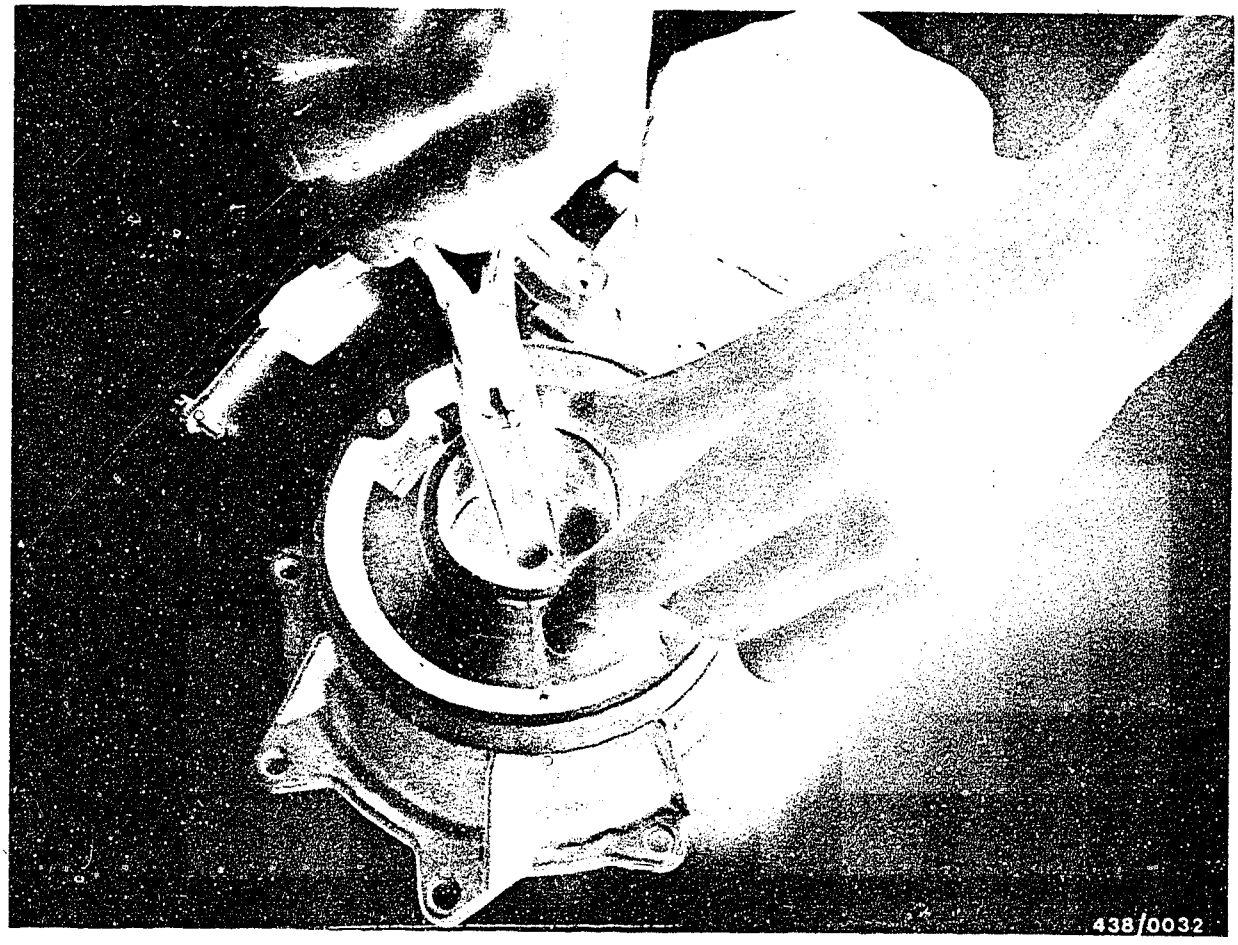
The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates G 7.

10. Checking and adjusting the position of the air-flow sensor plate

10.1 Preparations

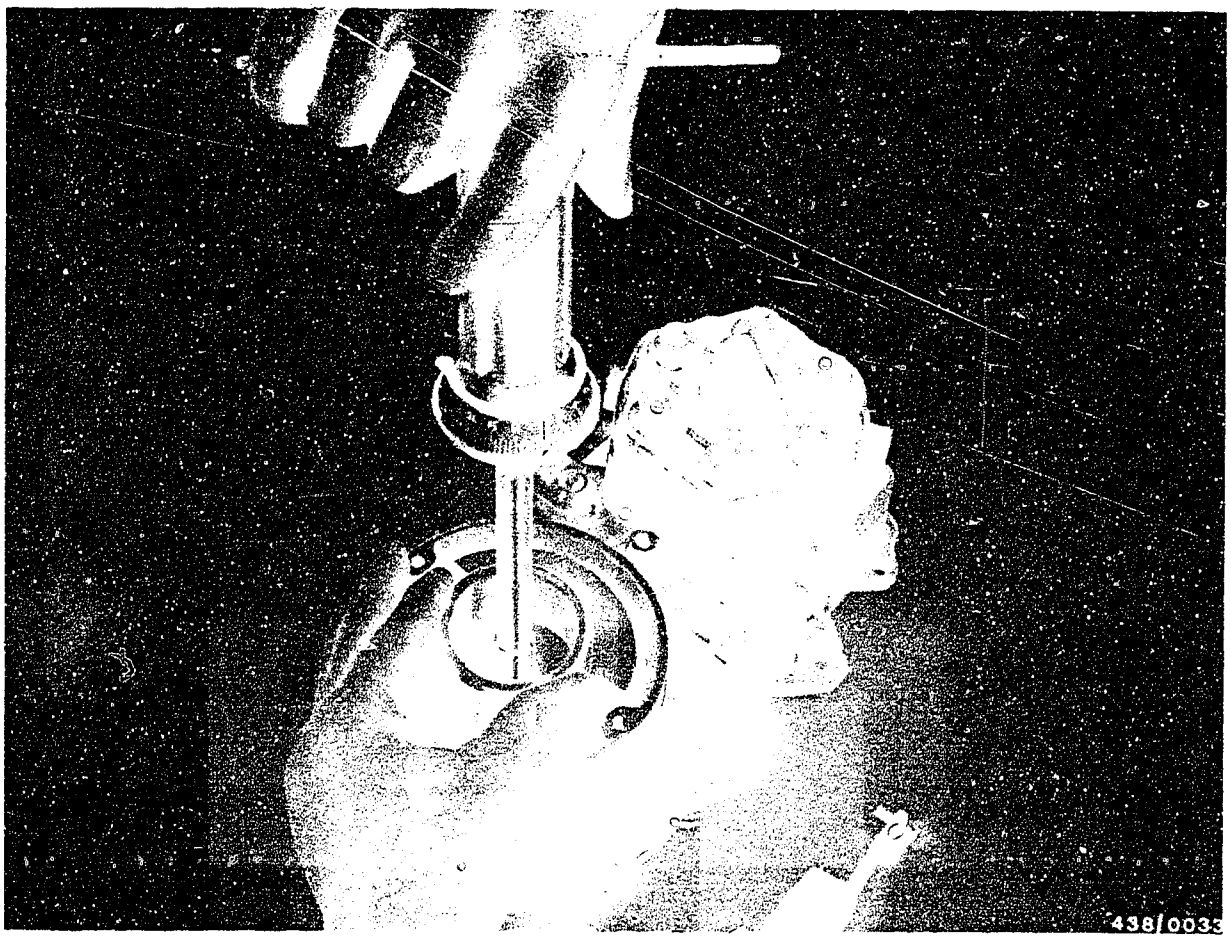
- Engine temperature is not important.
- Remove the air-filter connecting dome so that the air-flow sensor plate becomes accessible.



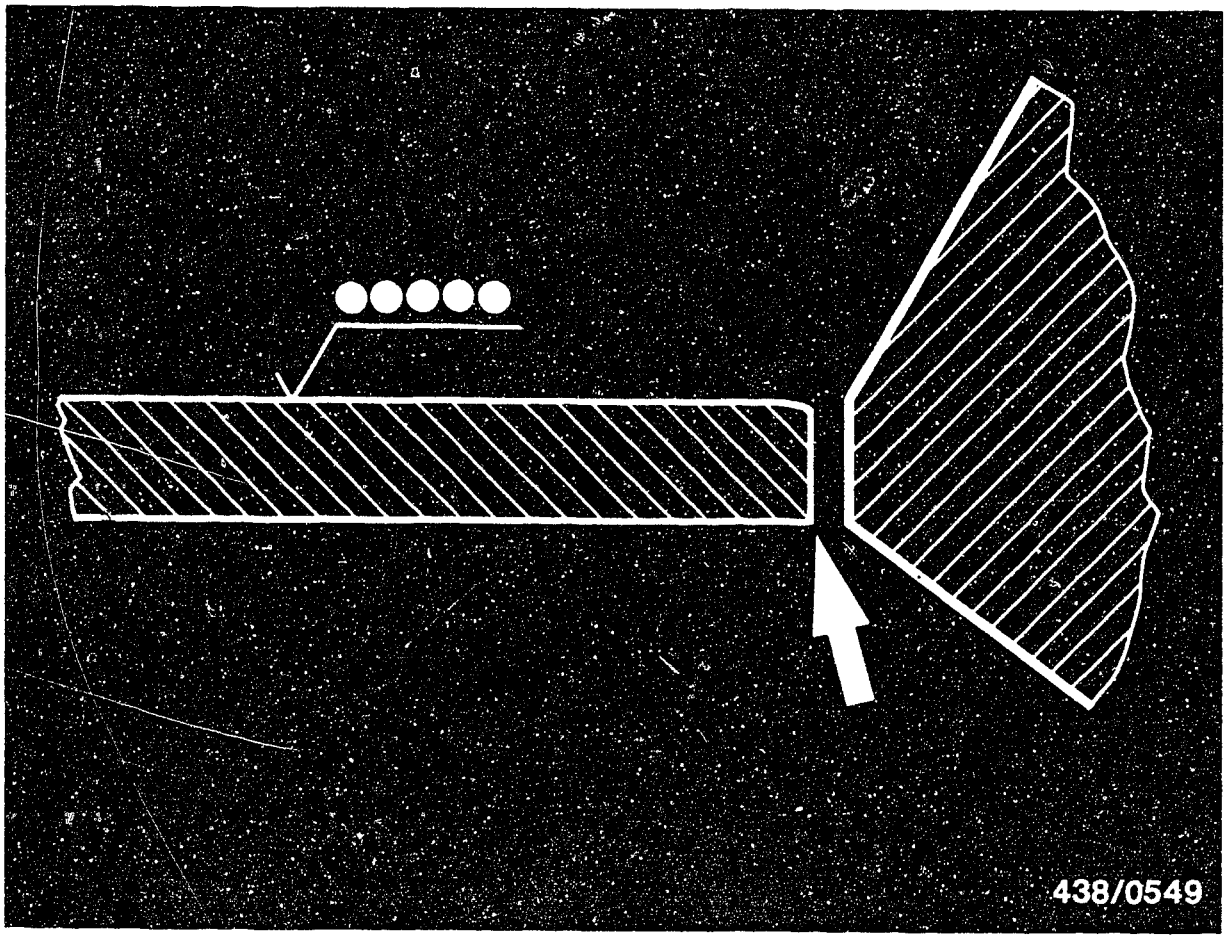
10.2 Centering the air-flow sensor plate

Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/13 (dia. 85 mm) as follows:

Remove stop bracket after loosening both fastening screws.
Insert the positioning ring while holding the fastening screw with pliers so that the sensor plate does not deflect downwards.



With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.
When tightening the screw make sure that the air-flow sensor plate is in zero position (in the cylindrical part of the air funnel).
It must no longer be possible to turn the air-flow sensor plate by hand.

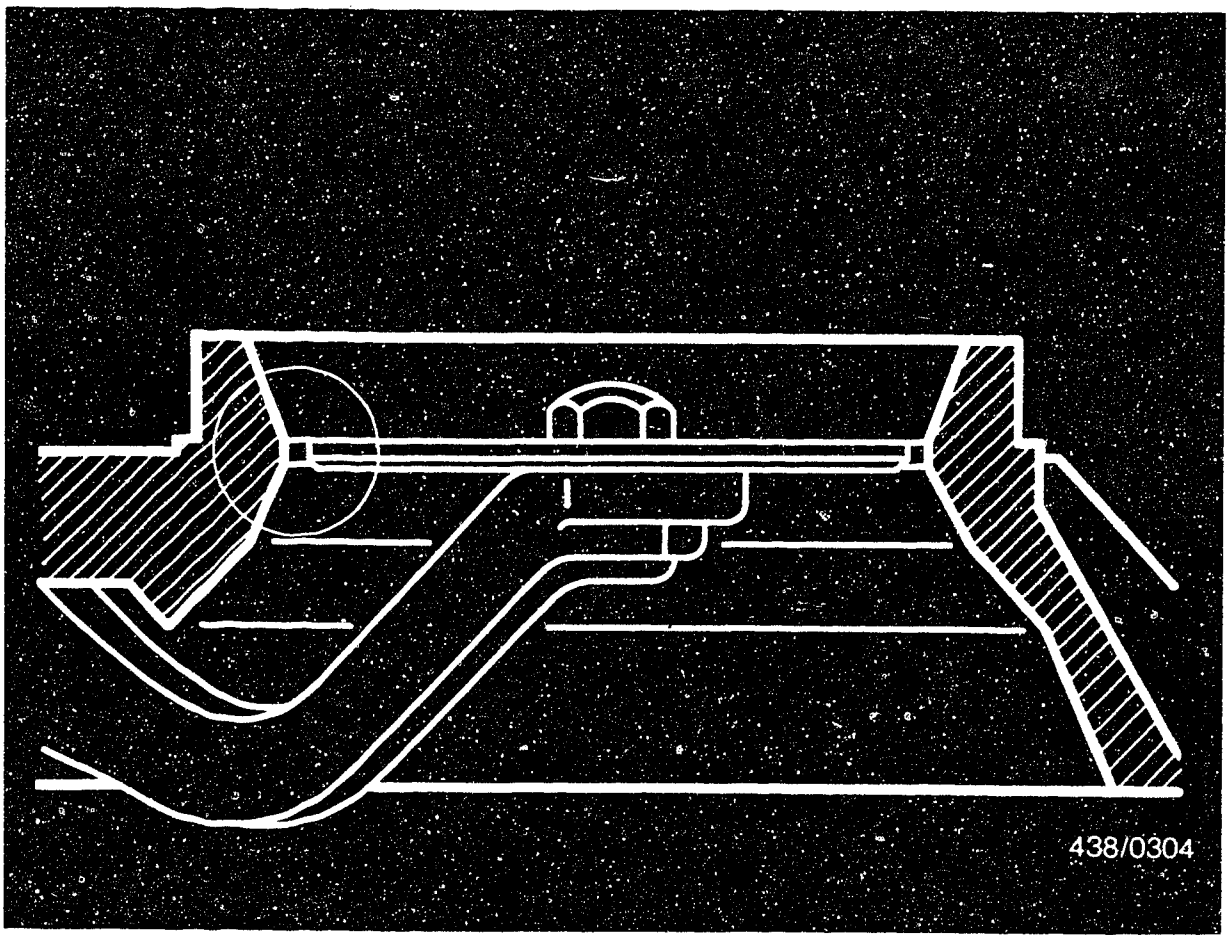


Caution:

Be sure that sensor plate is mounted in correct position!

Its upper side is identified by five punch marks (in a row).

The sharp edge (arrow) is at the bottom.

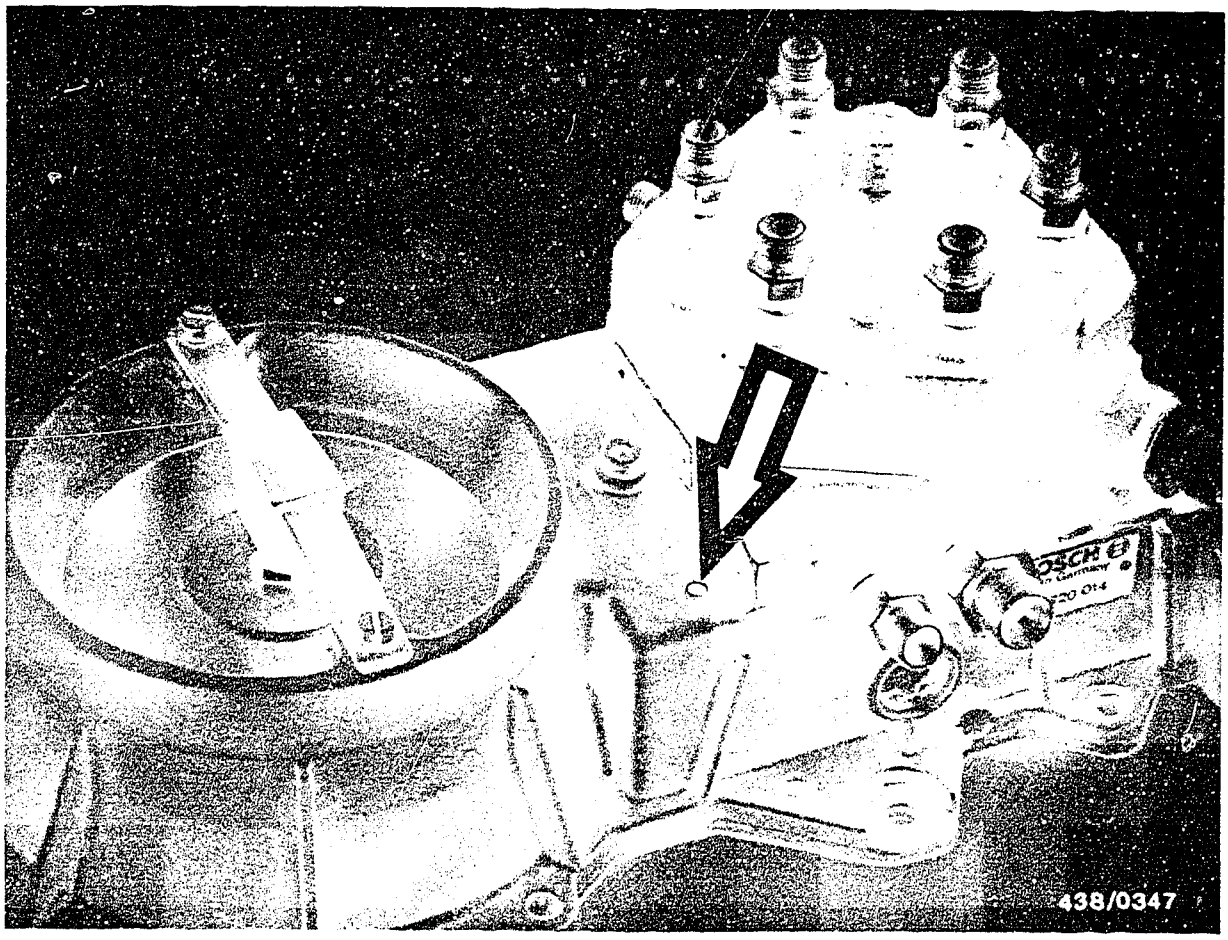


10.3 Checking and adjusting the zero position of the sensor plate (rest position):

Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the start of the conical section (relief cone at top) or may be max. 0.5 mm higher.

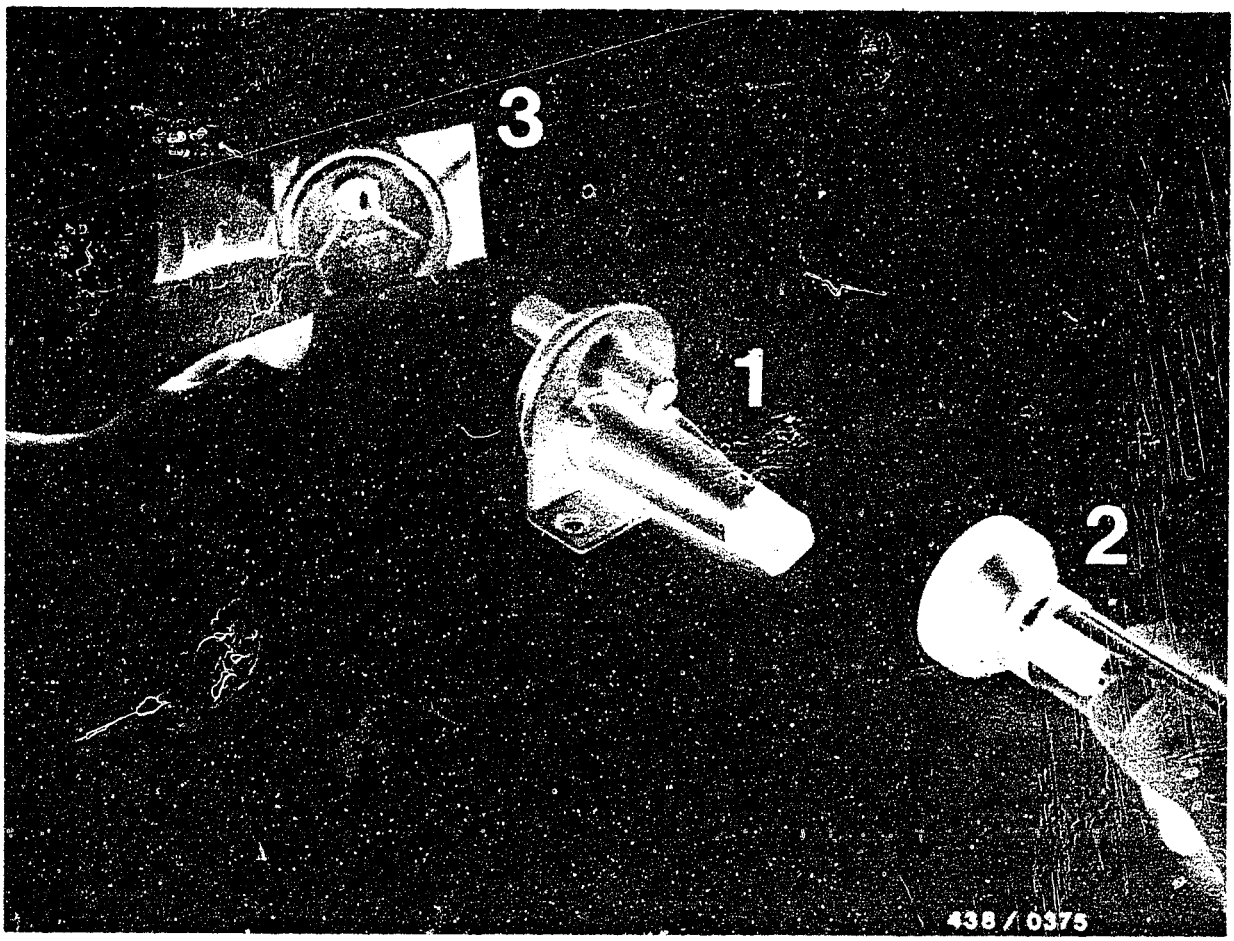
The air-flow sensor plate must be flat and must not project at any point on its circumference outside the cylindrical part of the air funnel.



If the sensor plate is positioned too high, an adjustment can be made. To do this, drive the guide pin (arrow) for the leaf-spring limit-stop deeper using a mandrel and a light hammer.

Caution:

Make this adjustment very carefully so that the guide pin is not driven in too far.
Be absolutely sure to avoid repeated adjustments in both directions because this can loosen the press fit of the pin. Serious engine damage can result if this pin should drop out.



1 = Auxiliary-air device
2 = Flashlight
3 = Mirror

11. Checking the operation of the auxiliary-air device.

The engine must be cold.
Disconnect the electric cable plugs from the auxiliary-air device and warm-up regulator.
Disconnect both air hoses from the auxiliary-air device.
Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open.
It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.

- If an opening is not visible with the engine cold, replace the auxiliary-air device.

- Fit the electric cable plug on the auxiliary-air device.

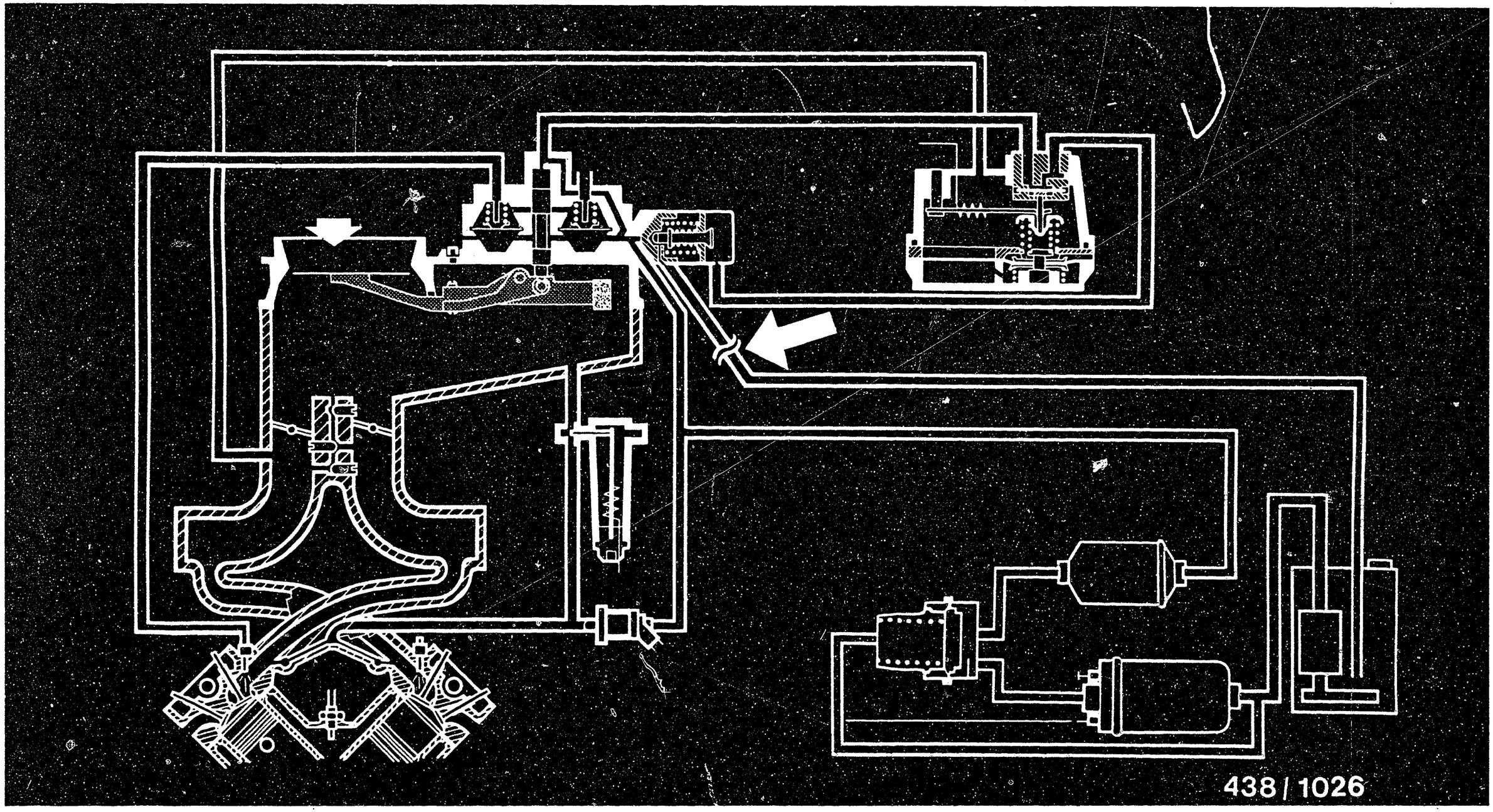
- By bridging the electrical safety circuit, supply power to the auxiliary-air device.
  After a maximum of 10 minutes, the opening in the auxiliary-air device must be completely closed by the blocking plate.

- If the blocking plate does not close, check the power supply (open circuit, voltage drop).
  Minimum voltage across the connector 11.5 V with the engine stopped.

- If these points are O.K., check the heating coil of the auxiliary-air device for an open circuit using an ohmmeter.

- Replace the auxiliary-air device if defective.

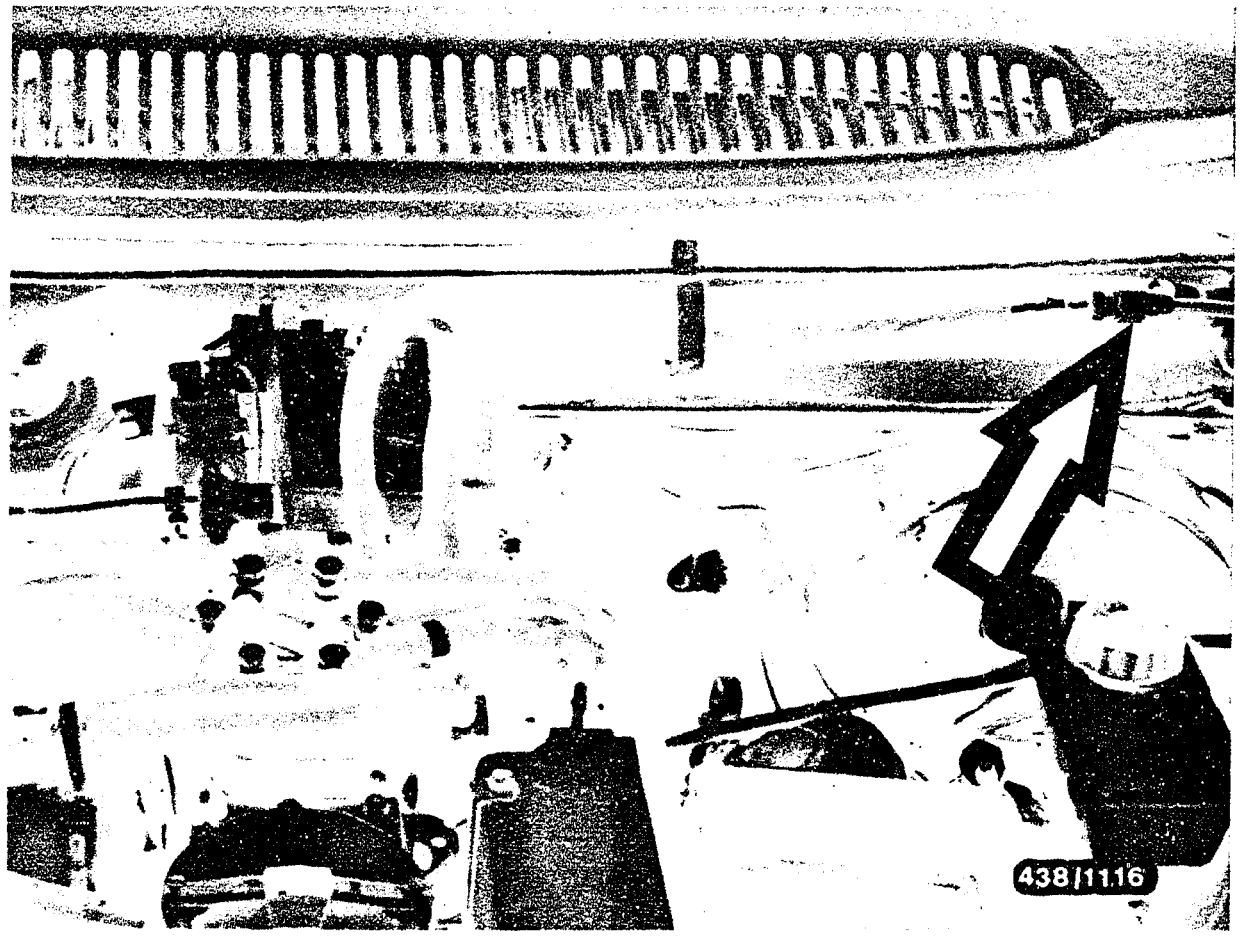
When the auxiliary-air device has been replaced, readjust the idle speed with the engine at normal operating temperature. Idle adjustment is described on Coordinates G 7.



12. Checking the operation of the electric fuel pump

12.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



12.2 Measuring point

A suitable measuring point for testing the fuel delivery is the screw connector (arrow) in the fuel return line to the fuel tank.

Undo the connector and hold the hose line (coming from the fuel distributor) in a graduate (approx. 1.5 liters capacity) in order to make the measurement.

12.3 Testing:

Remove the plugs from the warm-up regulator and auxiliary-air device.

Switch on the electric fuel pump for precisely 30 seconds by bridging the safety circuit and measure the delivery in a graduate.

C A U T I O N !

During testing, never depress (deflect) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected through the injection valves. When the engine is subsequently started this may lead to serious engine damage.

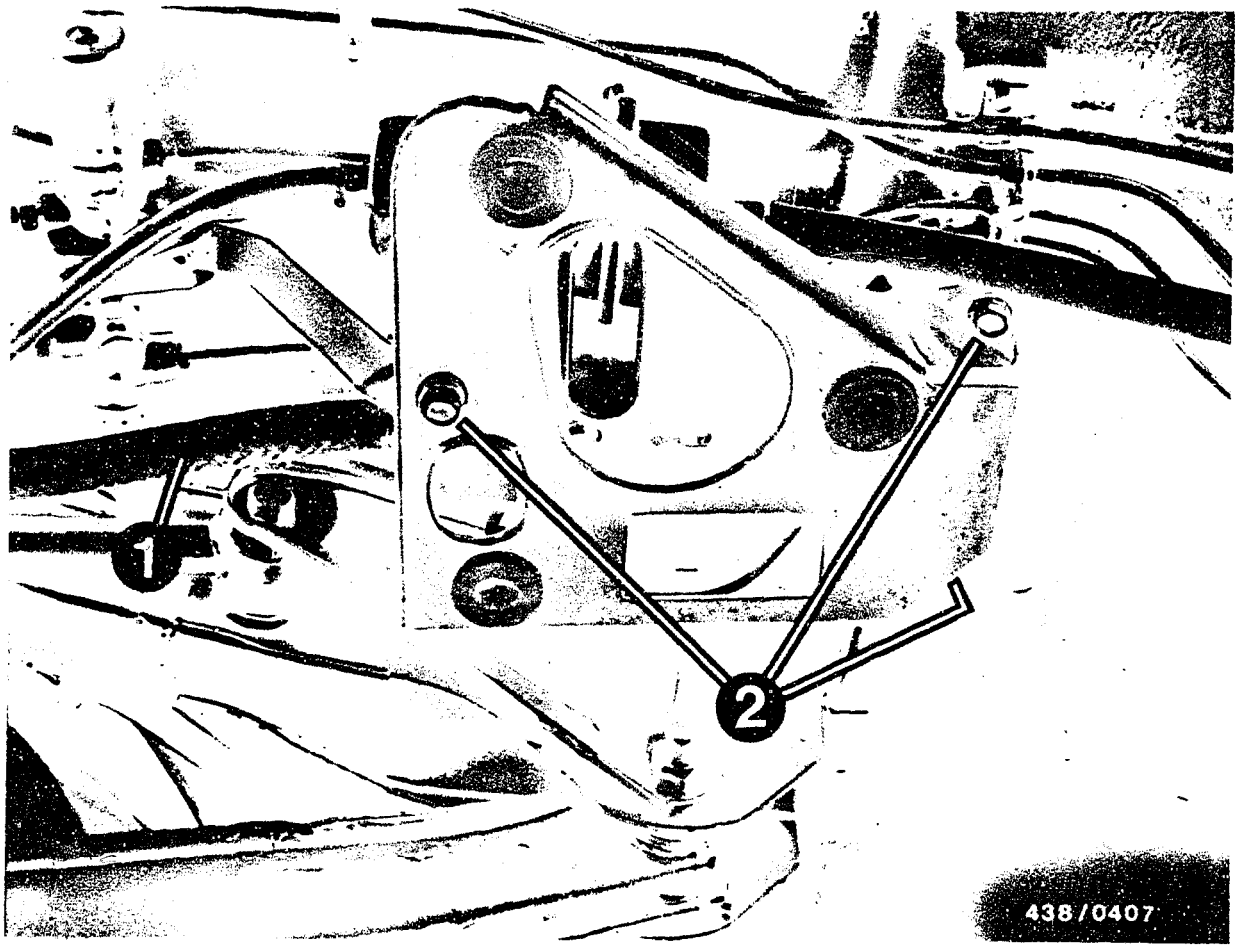
12.4 Test specification

Fuel delivery: min. 850 cm^3/30 seconds

12.5 Possible causes of insufficient fuel delivery:

- Power supply to the electric fuel pump defective, voltage drop.
  Necessary minimum voltage at terminal with pump operating = 11.5 V.
- Fuel filter very dirty.
- Pre-supply pump not operating.
  Carry out noise test, if necessary with the main electric fuel pump switched off.

If the above-mentioned points are O.K., the cause lies with the electric fuel pump itself.
Replace the electric fuel pump.



1 = Intake hose

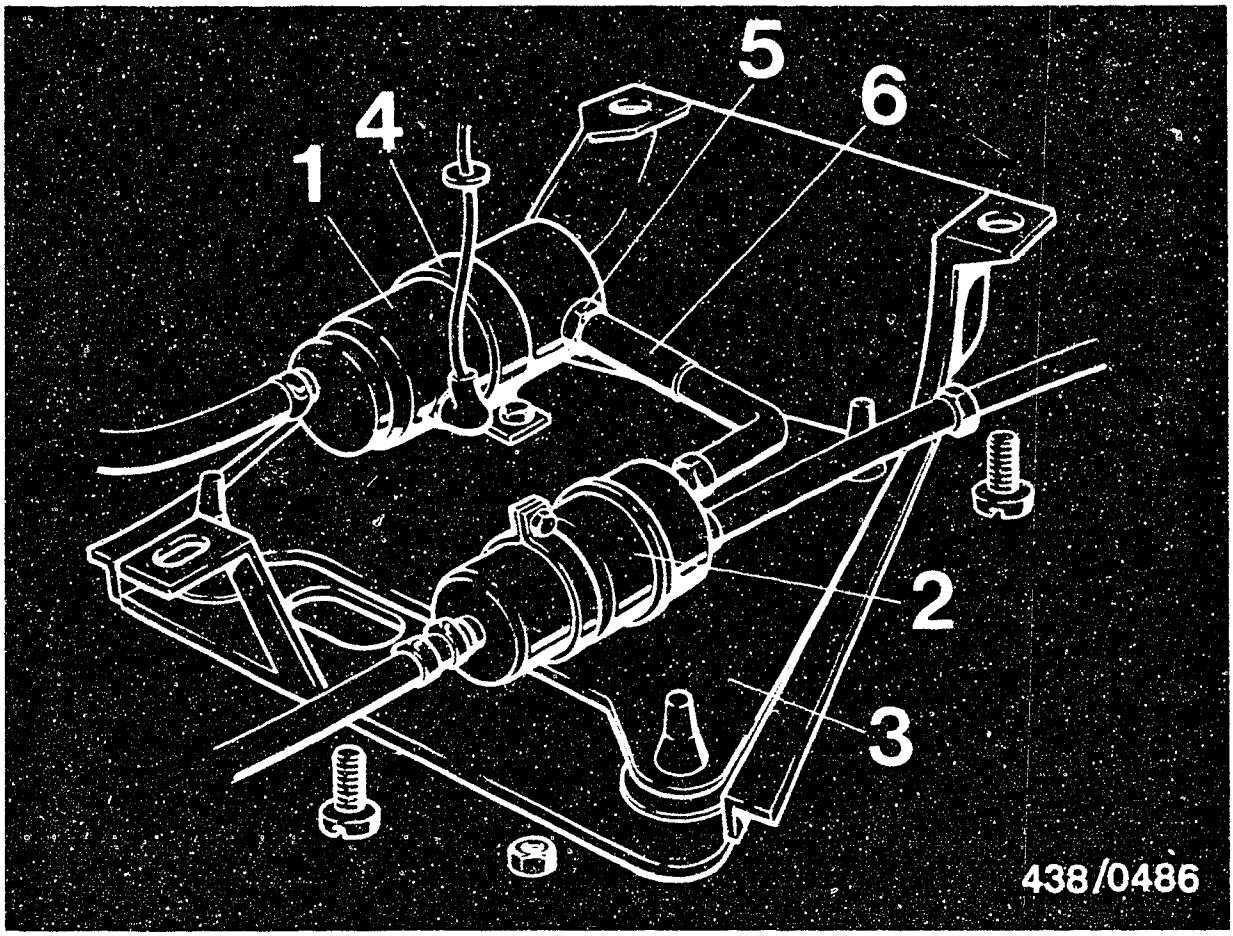
2 = Fastening screws

12.6 Removing and installing the electric fuel pump:

Pinch off the intake hose (1) (e.g. using hose clamper W 157 from Matra Co.) so that no fuel can escape from the fuel tank.

Loosen the hose clip and remove the intake hose from the fitting on the electric fuel pump.

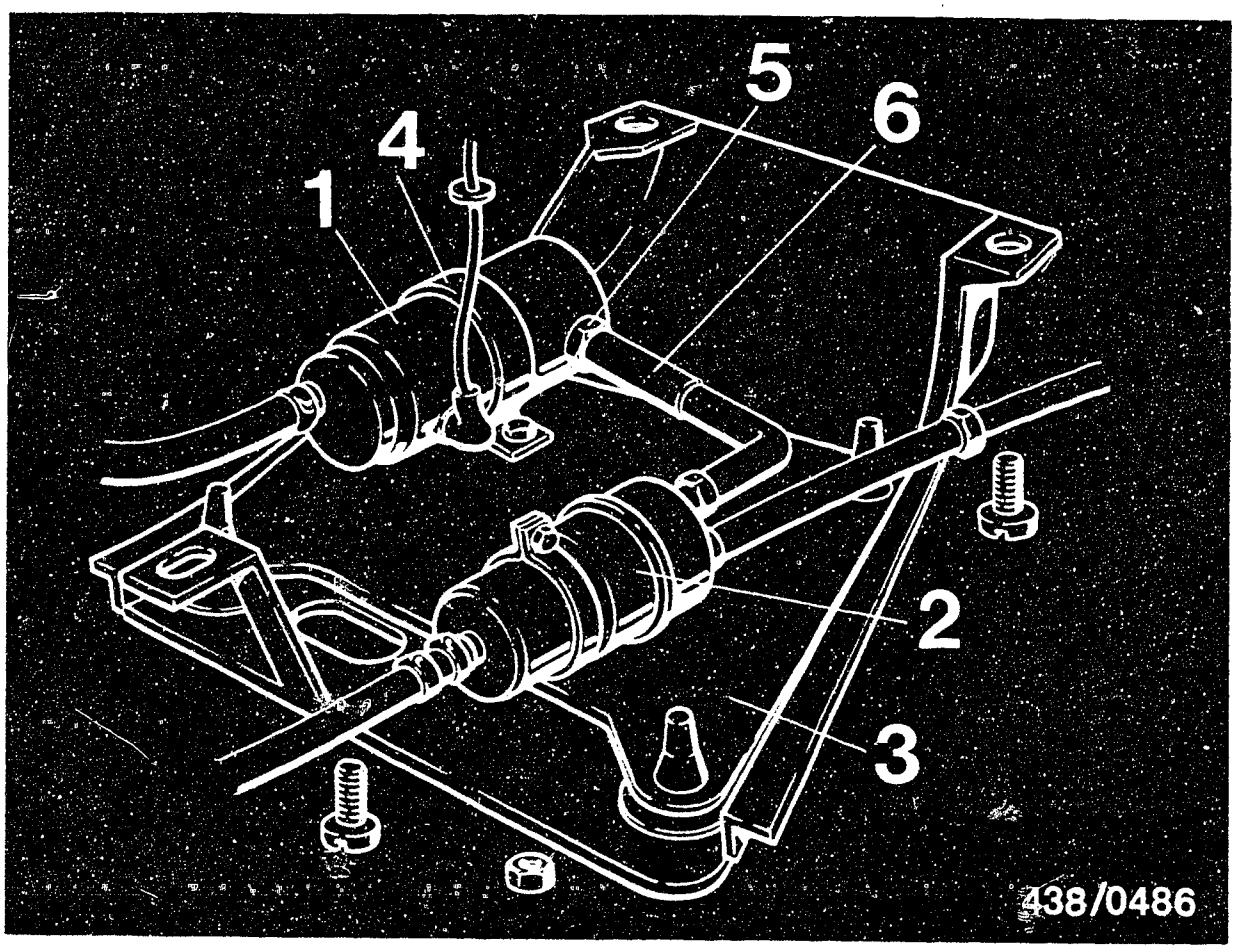
Remove the complete bracket by loosening the 3 fastening screws (2, one of the screws not visible in the picture) and hold slightly downward with the accumulator lines connected. Make sure that the lines still connected are not damaged.



1 = Electric fuel pump
2 = Fuel accumulator
3 = Bracket
4 = Clamping clip
5 = Delivery fitting with non-return valve
6 = Delivery line

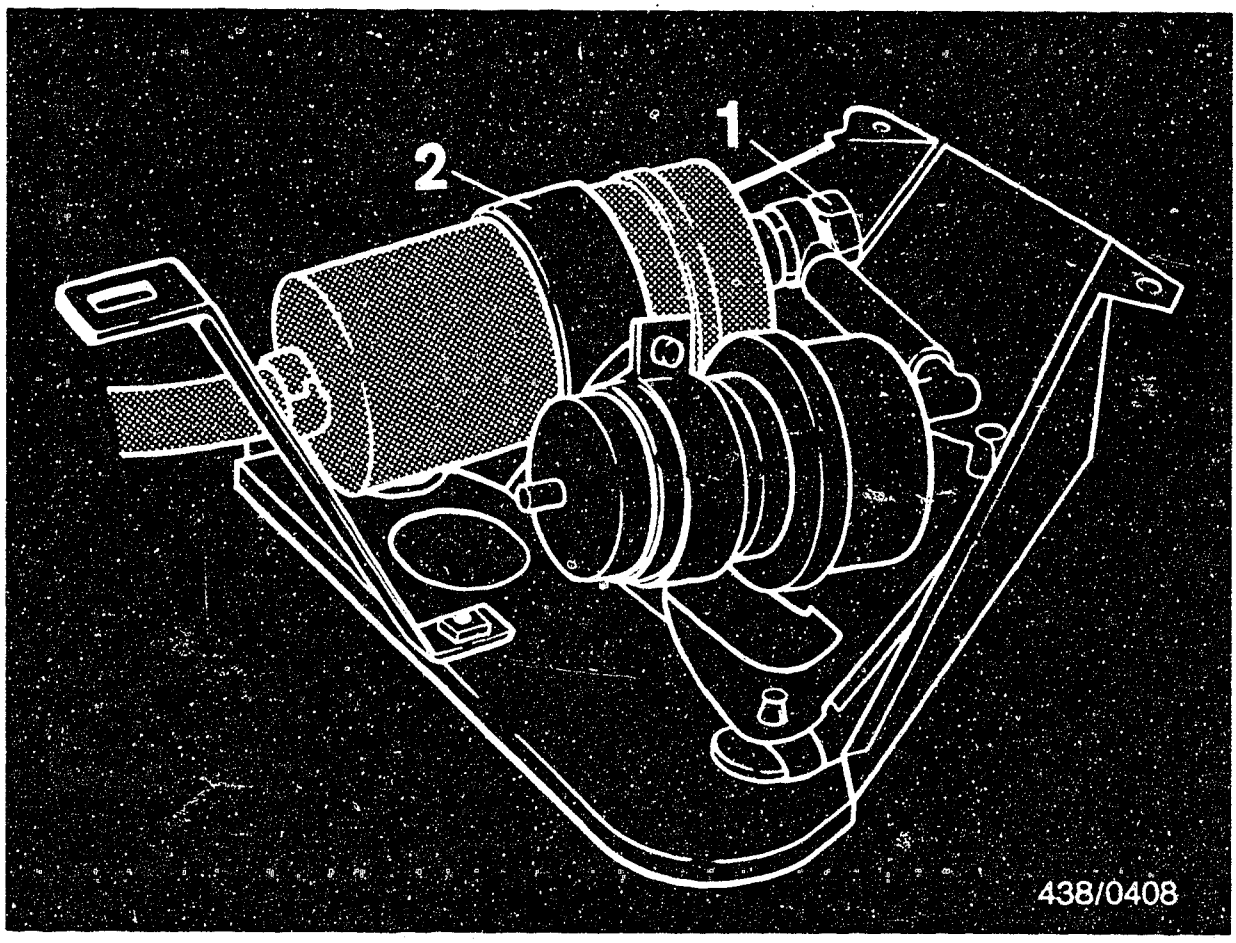
Up to 1979 model the Volvo vehicles were equipped with electric fuel pump Type EKP I (with side delivery fitting).

Removing the electric fuel pump:
Unscrew the delivery line (6) from the accumulator (2).
Unscrew the clamping clip (4) and remove the electric fuel pump.



Remove the delivery line (6) from the delivery fitting (5).

Install in the reverse order, ensuring that the delivery line (6) is in proper condition and that it is securely seated on the delivery fitting (5). If necessary, use a new delivery line (Volvo service part).
Then check all connections for leaks with the pump operating.



1 = Cap nut

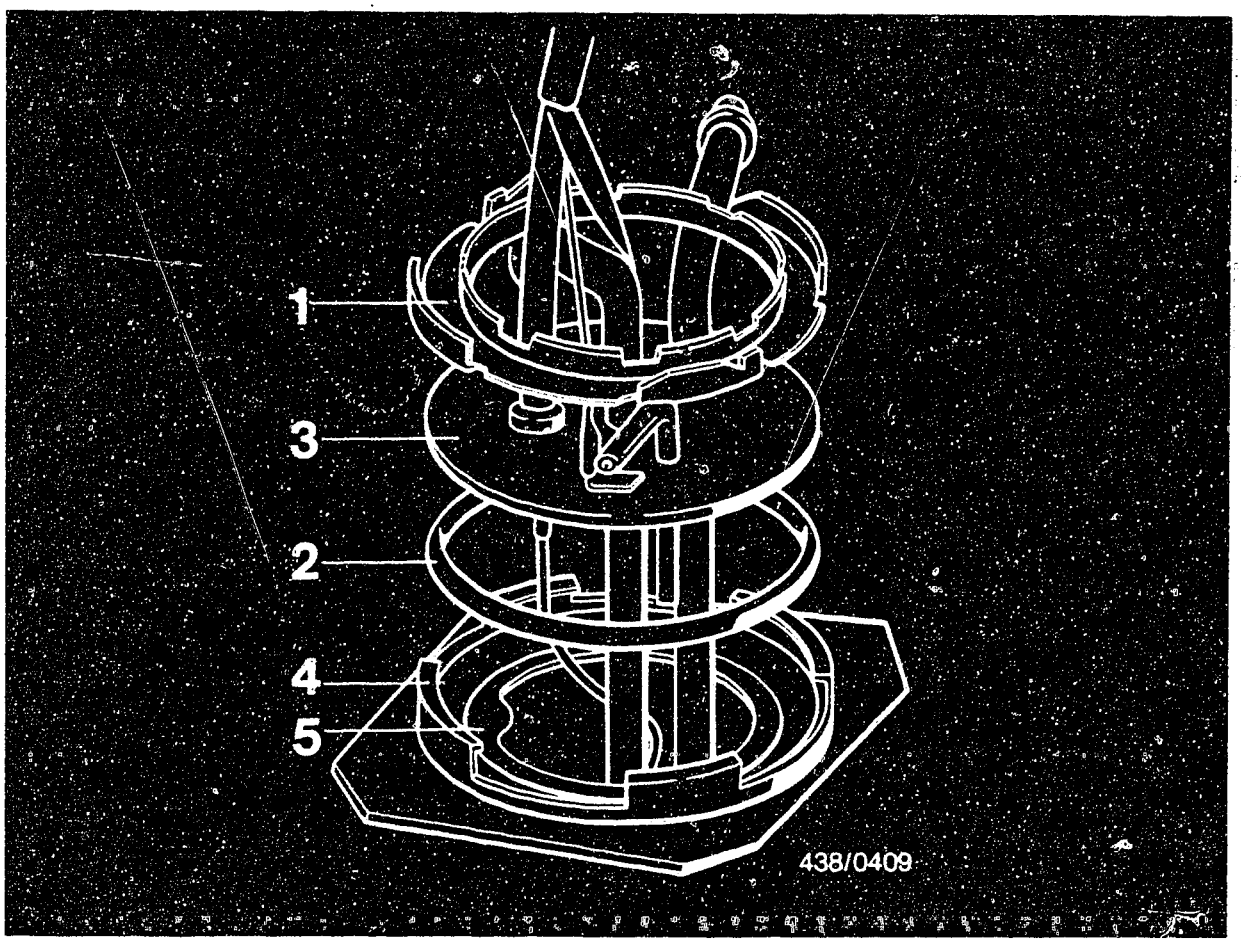
2 = Fastening clamp

As from the 1980 model, the Volvo models are equipped with an electric fuel pump of Type EKP IV (intake and delivery fittings central in the longitudinal direction of the pump).

Unscrew the delivery line (1) from the delivery fitting of the electric fuel pump. Loosen the clamping clip (2) and remove the electric fuel pump.

Install in the reverse order, using new seal rings for the delivery line.

Finally, check all connections for leaks with the pump operating.



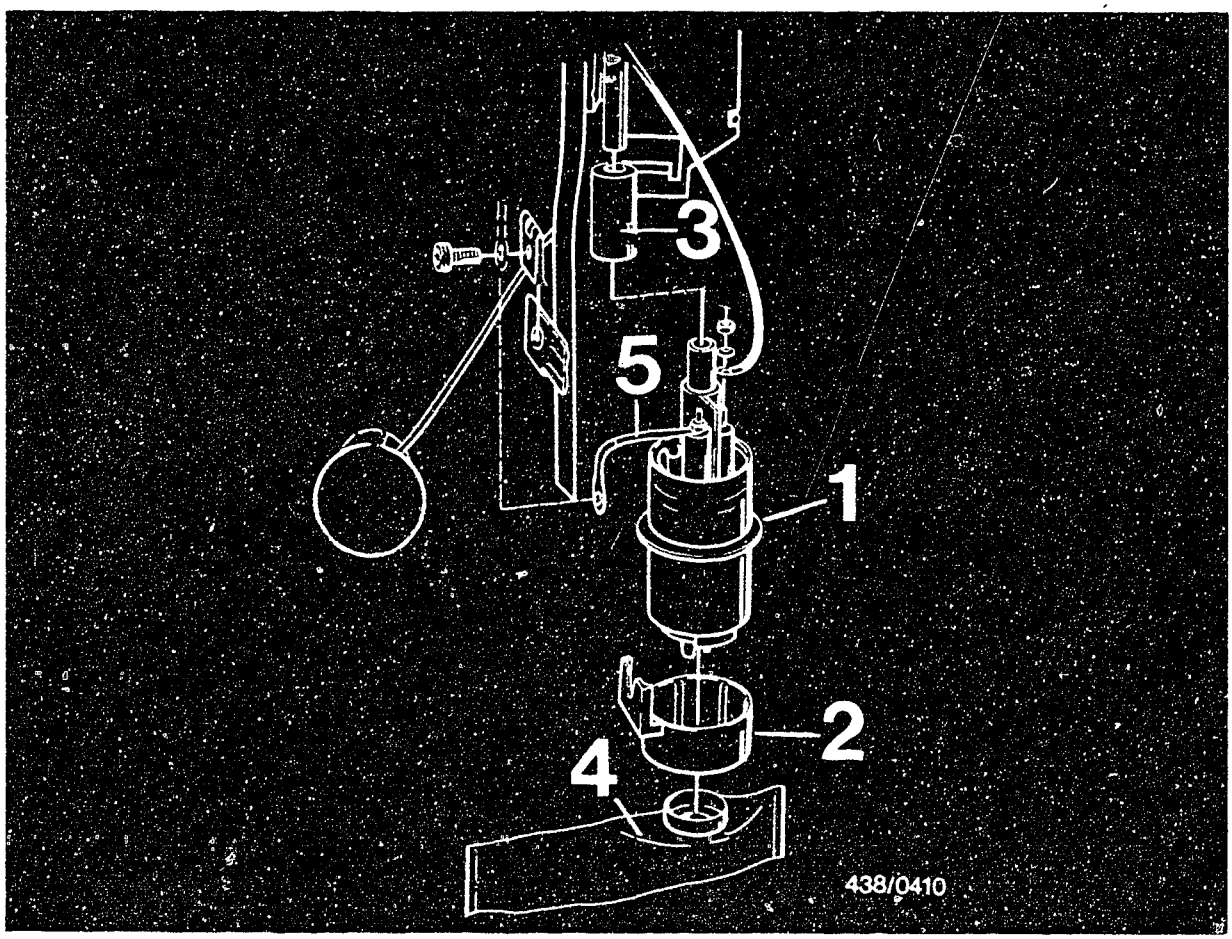
1 = Fastening ring
2 = Fastening flange
3 = Seal ring
4 = Installation opening in fuel tank
5 = Locator

12.7 Removing and installing the pre-supply pump:

The pre-supply pump is combined to form one unit together with the pickup for the fuel level indicator. The pickup becomes accessible after removing the luggage-compartment mat and the small cover fastened by 2 screws. Clean the immediate surrounding area in order to remove the pickup. Loosen the fastening ring by turning in a counterclockwise direction and carefully remove the pickup from the fuel tank.

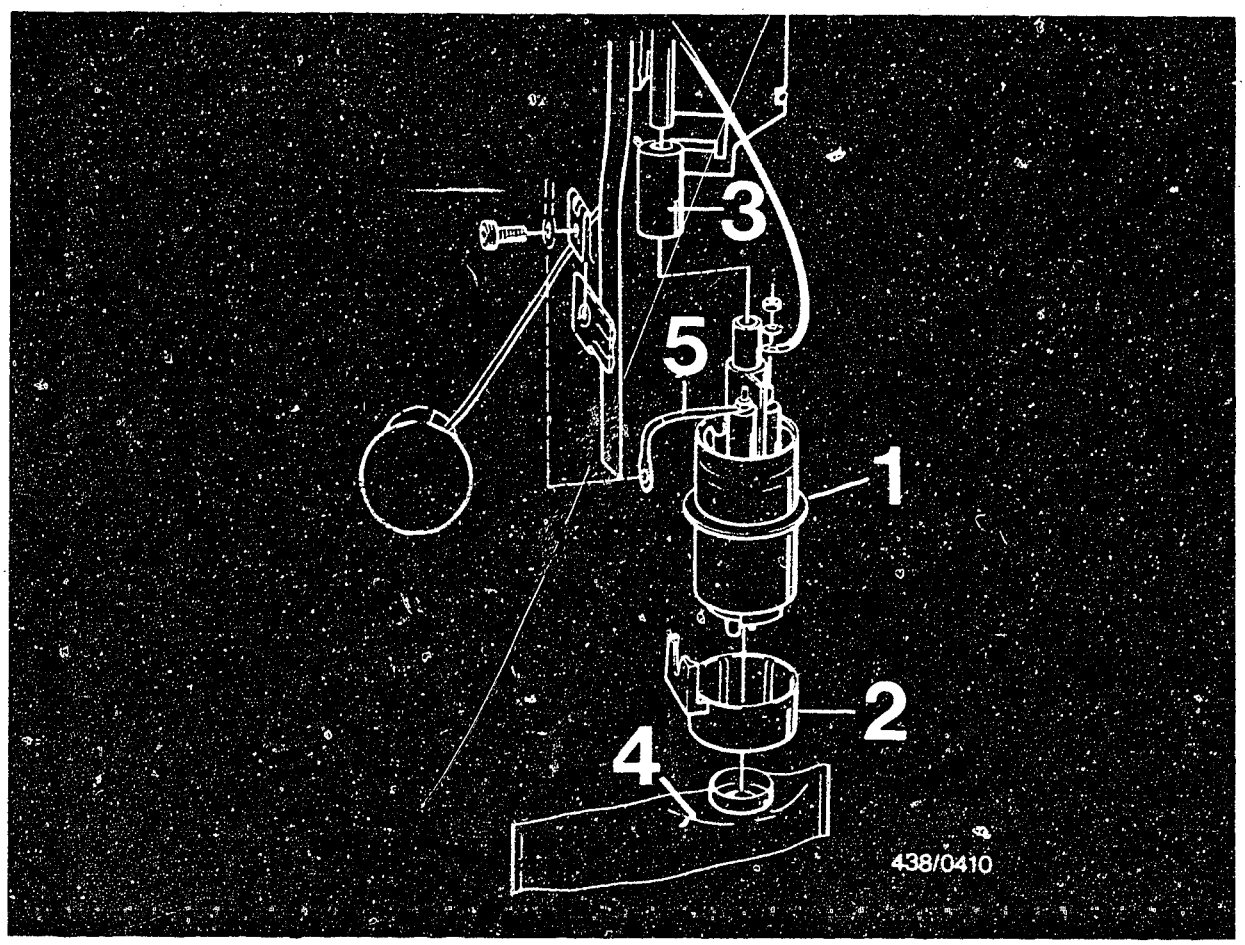
Note the following points when replacing the pre-supply pump after the pickup has been removed.

When installing, it may be necessary to use a new seal ring. Ensure the correct position of the fastening flange so that it locates in the installation opening.



So far Volvo has used two different makes of pre-supply pump, VDO and AC.

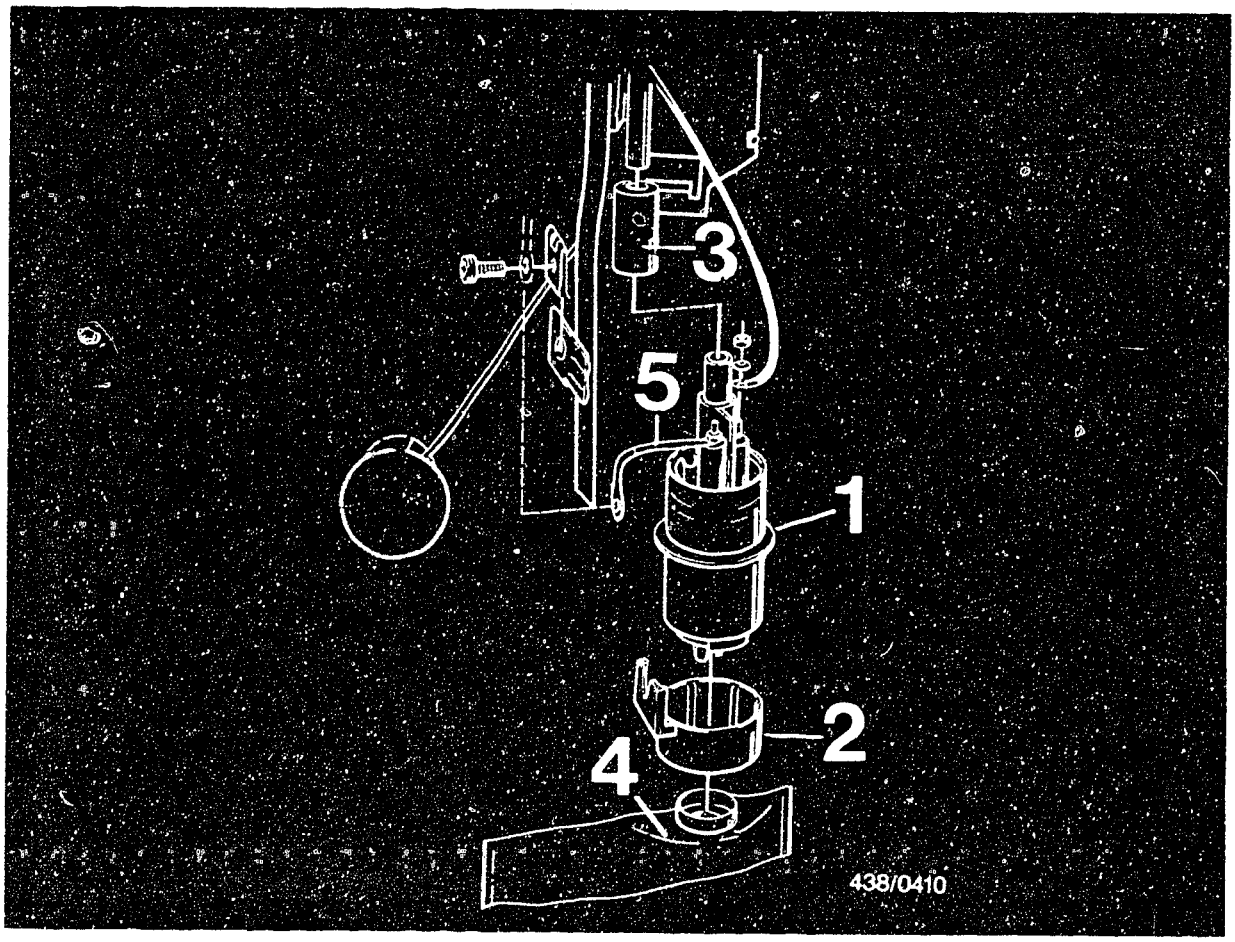
As of the end of 1980 Volvo only supplies the AC pump as a service part. If the pre-supply pump is defective, therefore, it may be necessary to replace a VDO pump with an AC pump.



The following parts are required for conversion (purchase from the Volvo agent with the pre-supply pump):

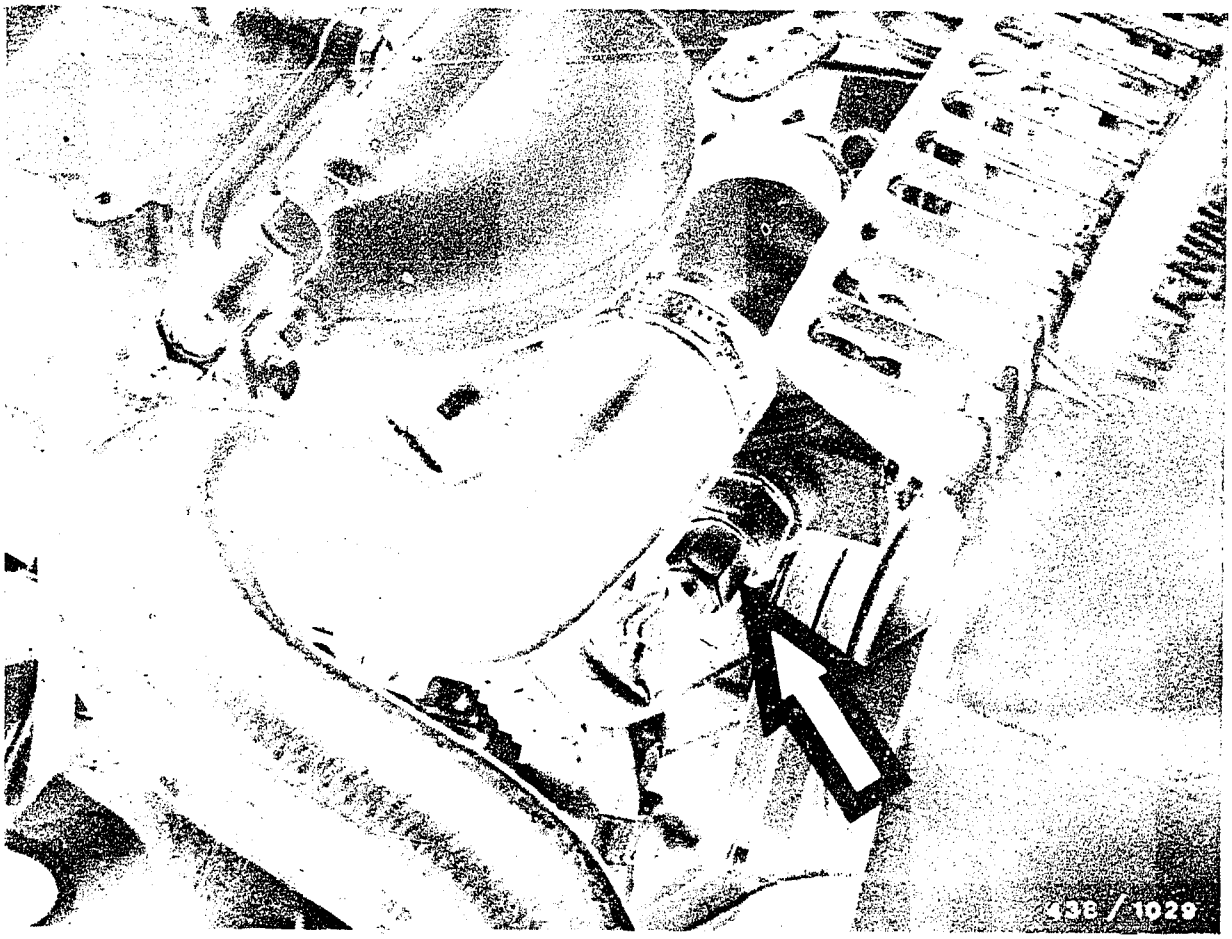
1 = Pre-supply pump
2 = Bracket
3 = Tailpiece (if required)
4 = Intake filter (if required)
5 = Ground strap

When converting, connect the ground strap directly to the negative terminal of the AC pump.



In contrast to the VDO pump, the AC pump is not interference-suppressed. Therefore, after installing the AC pump, fit an interference-suppression resistor (Volvo Part No. 1 235 204-3).
This resistor is connected into the positive lead outside the fuel tank (in series).

As from the beginning of 1981, a new pickup for the fuel level indicator is available from Volvo (Volvo Part No. 1 258 853-9). This pickup is specially prepared for the AC pump and is interference-suppressed.



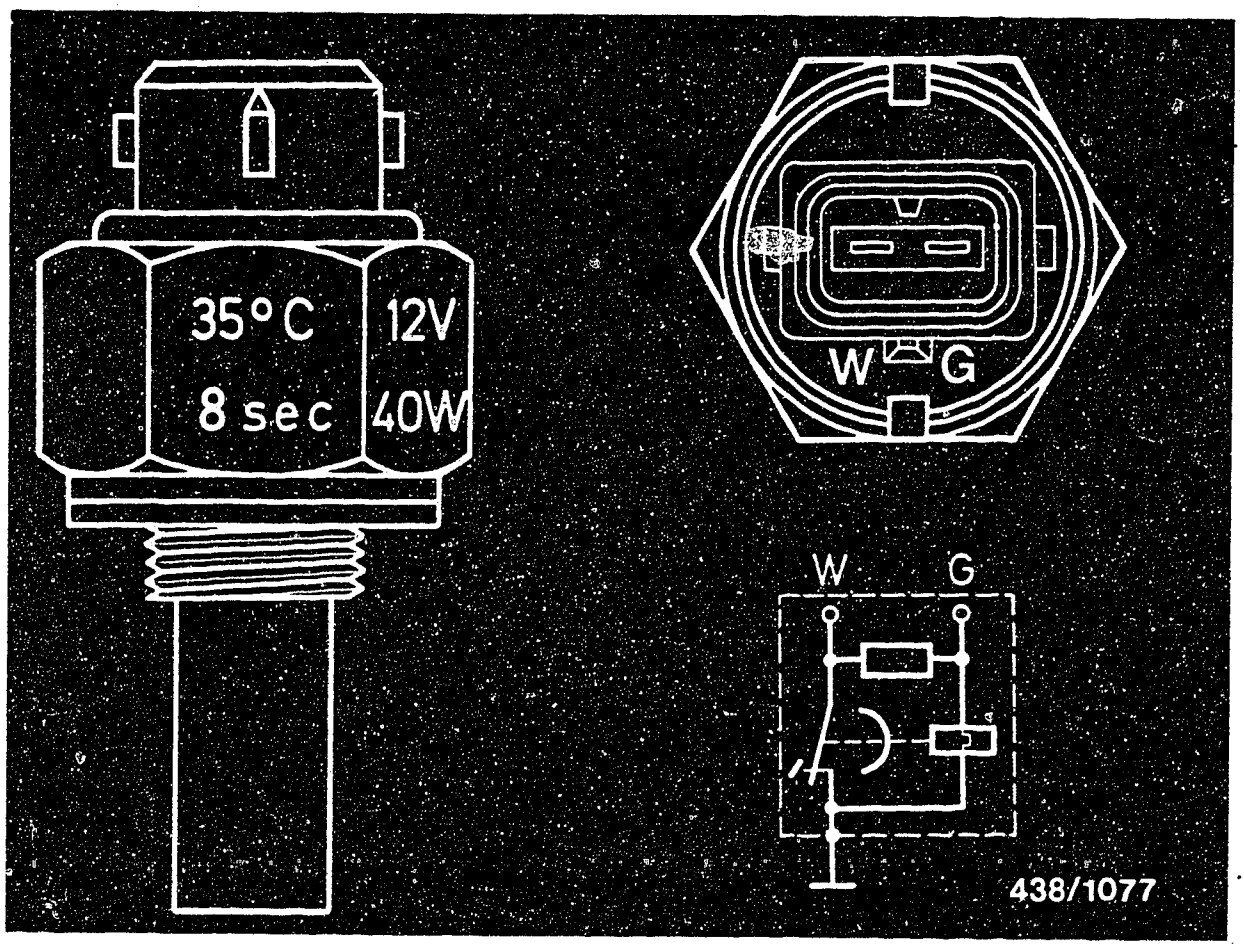
13. Testing the cold-starting system (thermo-time switch, start valve)

13.1 Thermo-time switch:

Remove the thermo-time switch (arrow) for testing.

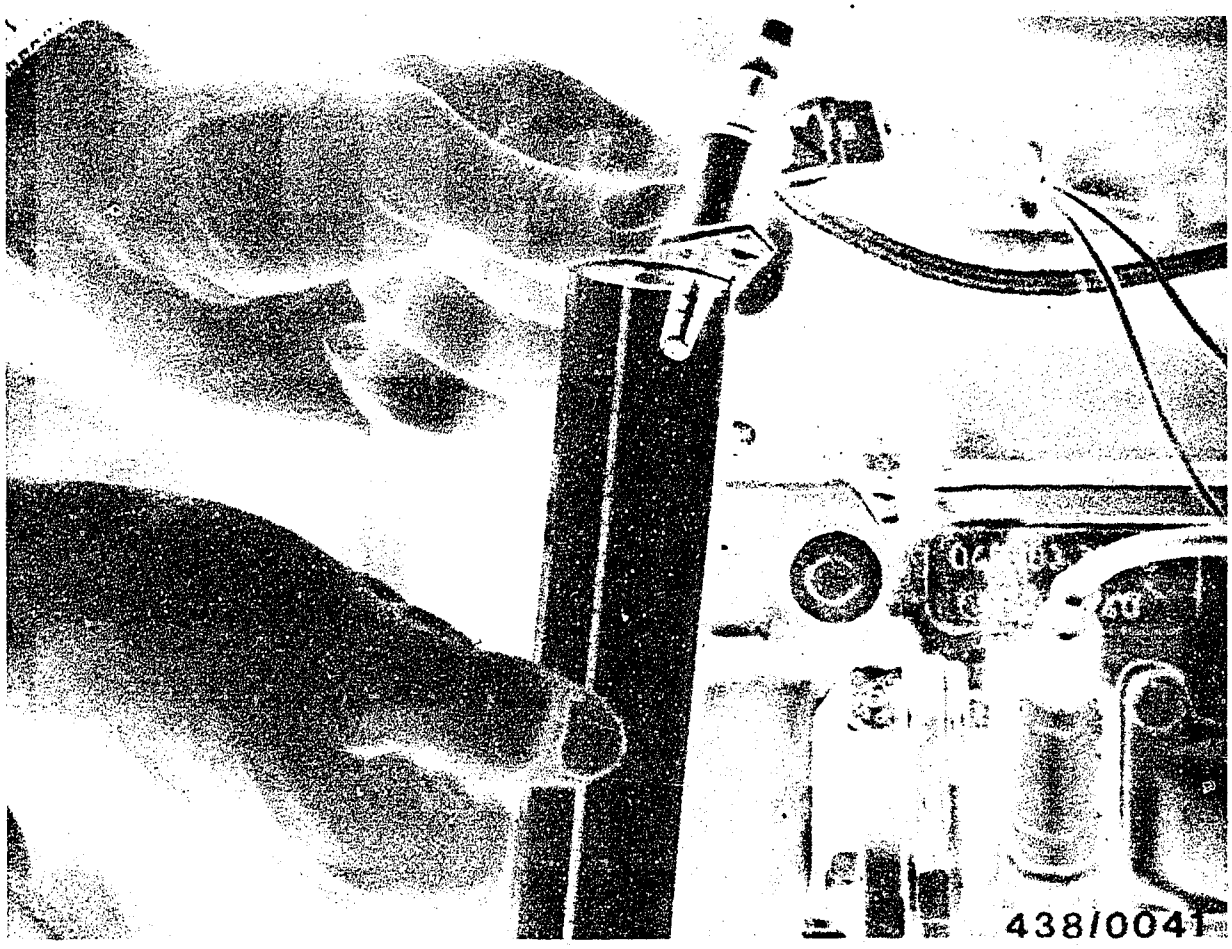
Caution:
If possible, remove only when the engine is cold since a small amount of coolant will escape. The amount of coolant escaping would be considerably greater if the engine were hot.

Catch escaping coolant in a container.



The switching temperature +35°C and the switching time at -20°C of 8 seconds are stamped into the hexagonal section of the thermo-time switch. The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below.
The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

At a temperature below °C	above °C	Resistance measurement (Ω) between Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and term. "W"
+30		25...40	0	25...40
	+40	50...80	100...160	50...80



13.2 Start valve:

Remove the start valve. Hose line remains connected. Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.

Important note:
During this test, do not let the connecting cable touch B +. Danger of fire due to sparking!
Hold the start valve in a suitable container (e.g. the graduate).

Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

C A U T I O N !

During testing, never depress (deflect) the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected through the injection valves. When the engine is subsequently started this may lead to serious engine damage.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates G 7.

14. Checking the control pressures

14.1 Preliminary remarks:

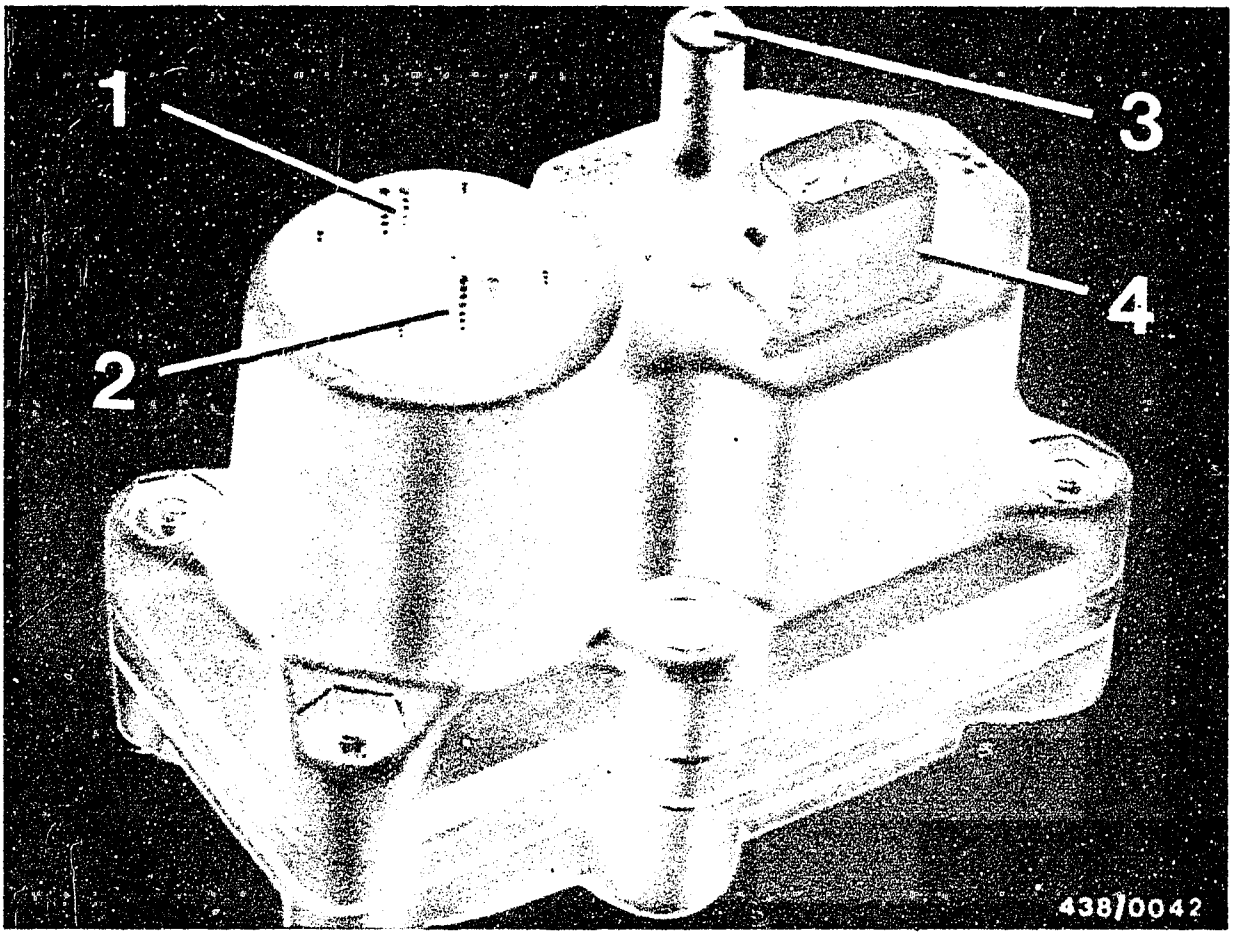
The control pressures tested in the following are in each case governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

These possible faults are:

- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted.
- Too high a fuel delivery for the control-pressure circuit.

The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.
Test specification: 160...240 cm^3/min.

Reference is made to the other possible causes of trouble in the respective test step.

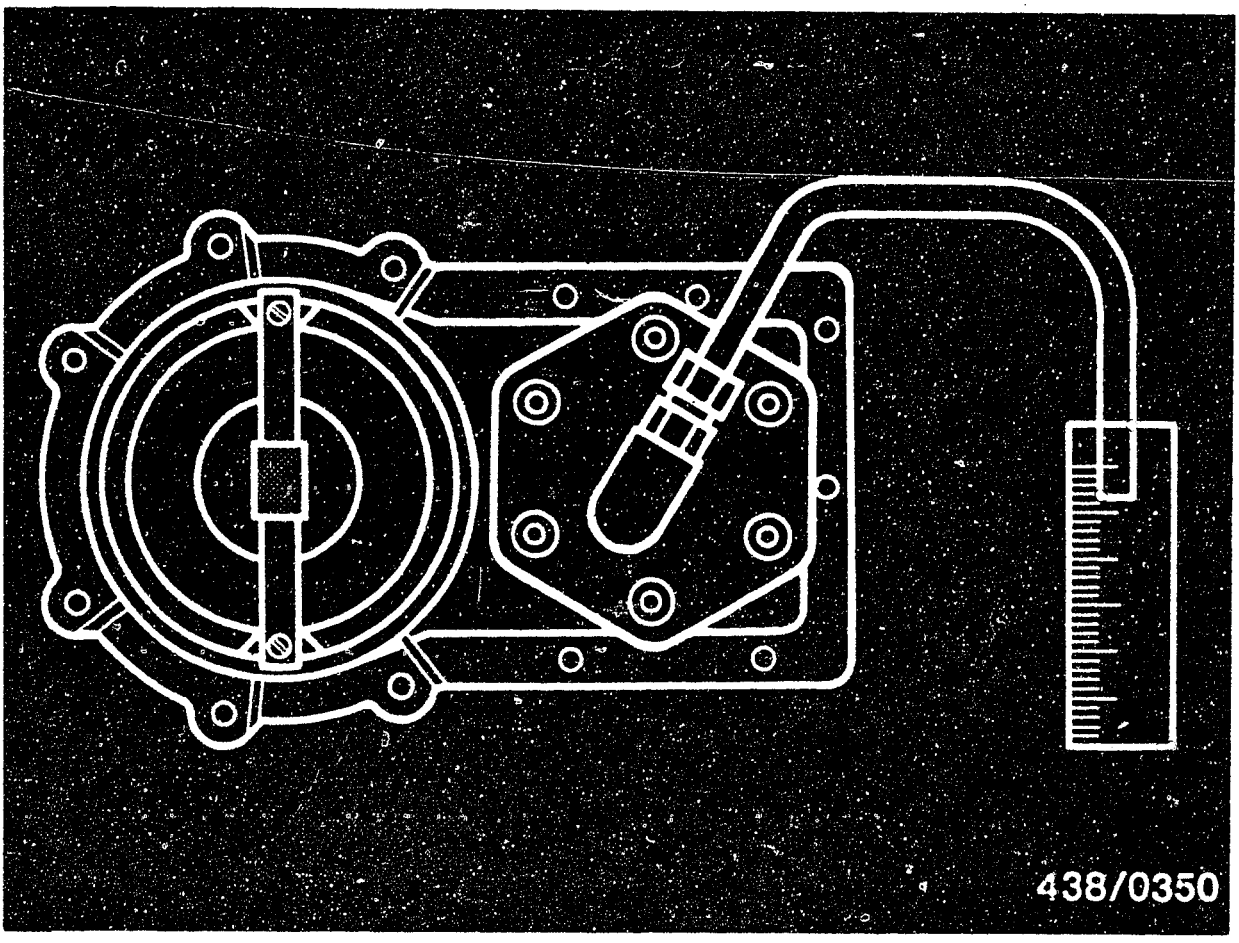


1 = Return port (M 8 x 1)
2 = Inlet port (M 10 x 1)
3 = Connection port for intake manifold pressure (after throttle valve)
4 = Electrical connection

14.2 Version of warm-up regulator

- Warm-up regulator No. 0 438 140 018, ... 038

The warm-up regulator is a version for intake-manifold-pressure-controlled full-load enrichment. This means that the cold and warm control pressures are additionally influenced by the manifold pressure acting on the full-load diaphragm of the warm-up regulator.
The intake-manifold-pressure connection port (3) is on the top of the housing cover.



14.3 Checking the fuel delivery for the control-pressure circuit

Before testing:

Make sure that the electric fuel pump is in proper working order.

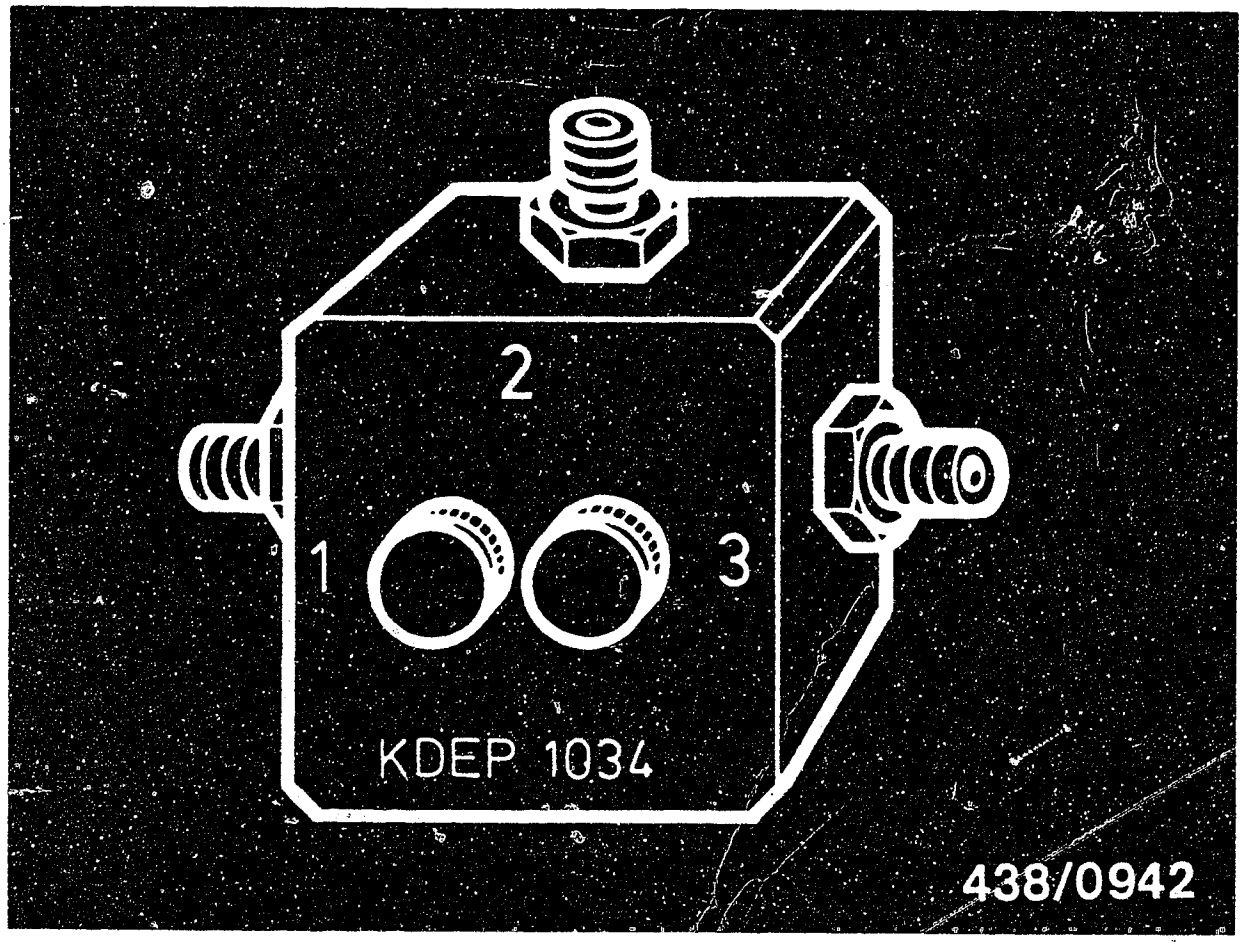
Test specification: Min. 850 cm^3/30 s

Unscrew control-pressure line (coming from fuel distributor) on warm-up regulator and hold end of hose in a graduate (approx. 0.5 l capacity).

Switch on the electric fuel pump for 1 minute by bridging the safety circuit.
Measure delivery.

Test specification: 160...240 cm^3/min.

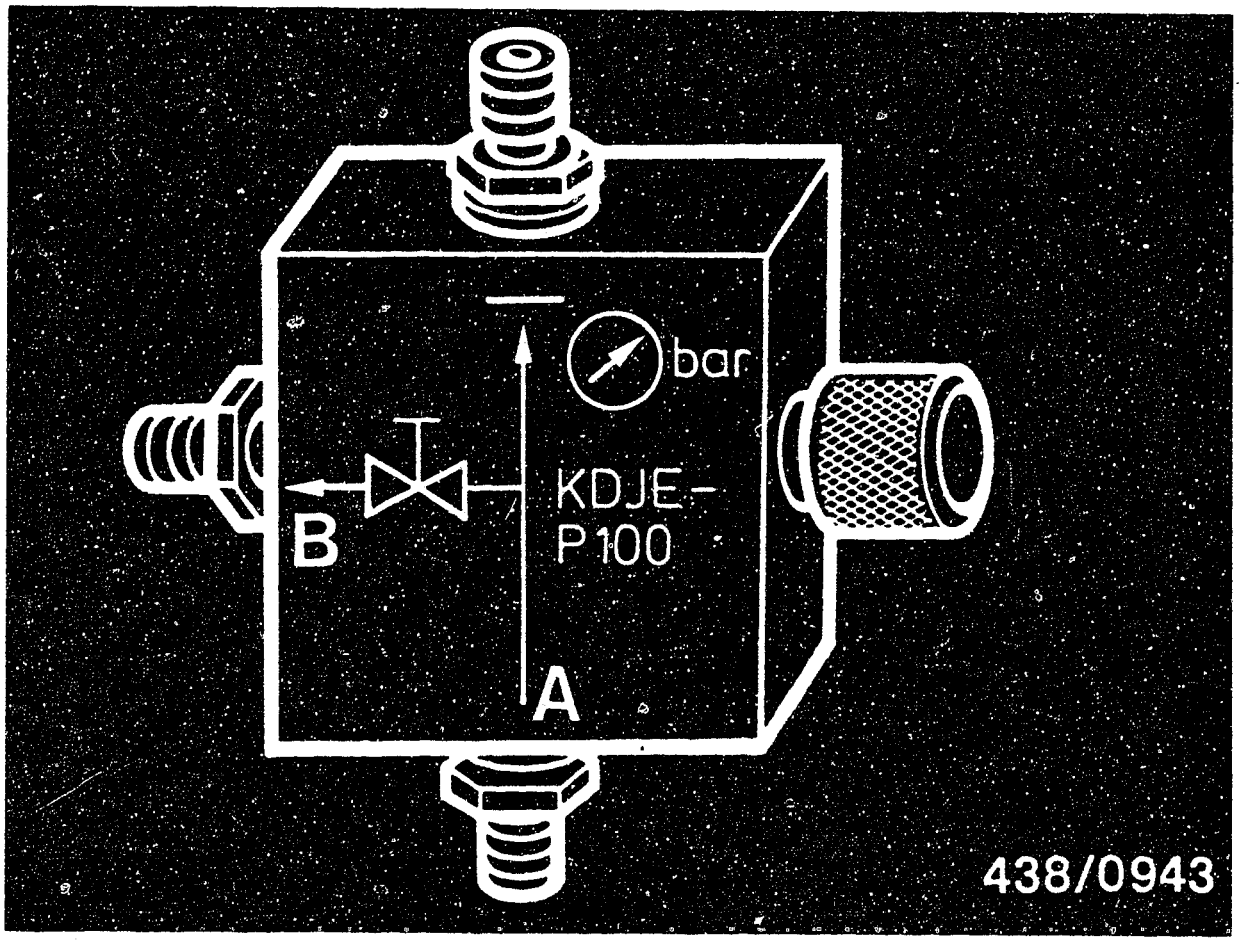
If the measured value is outside tolerance, the fault is in the fuel distributor.
Replace the fuel distributor.



14.4 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws.

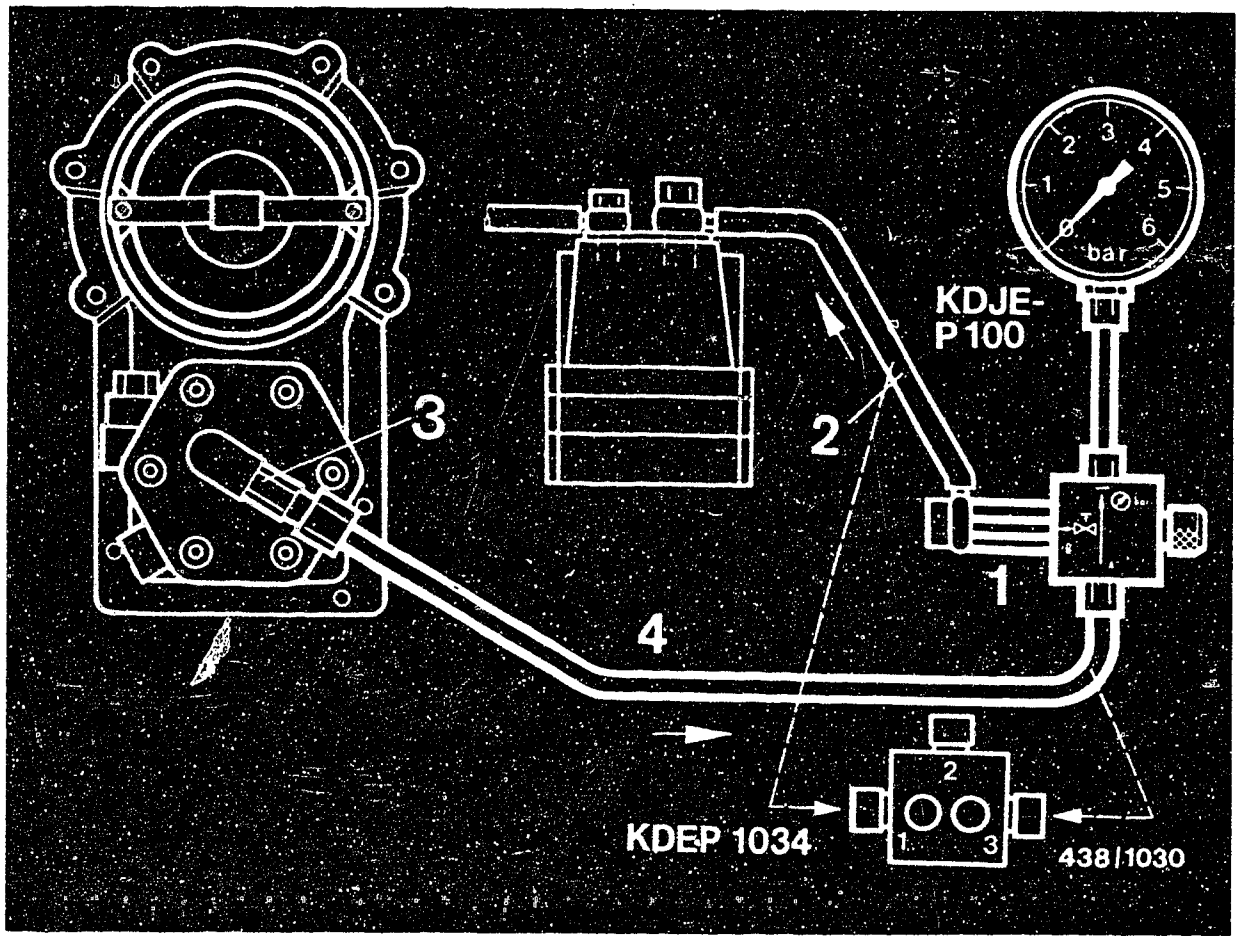
The connections of the directional-control valve are numbered.



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw. The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

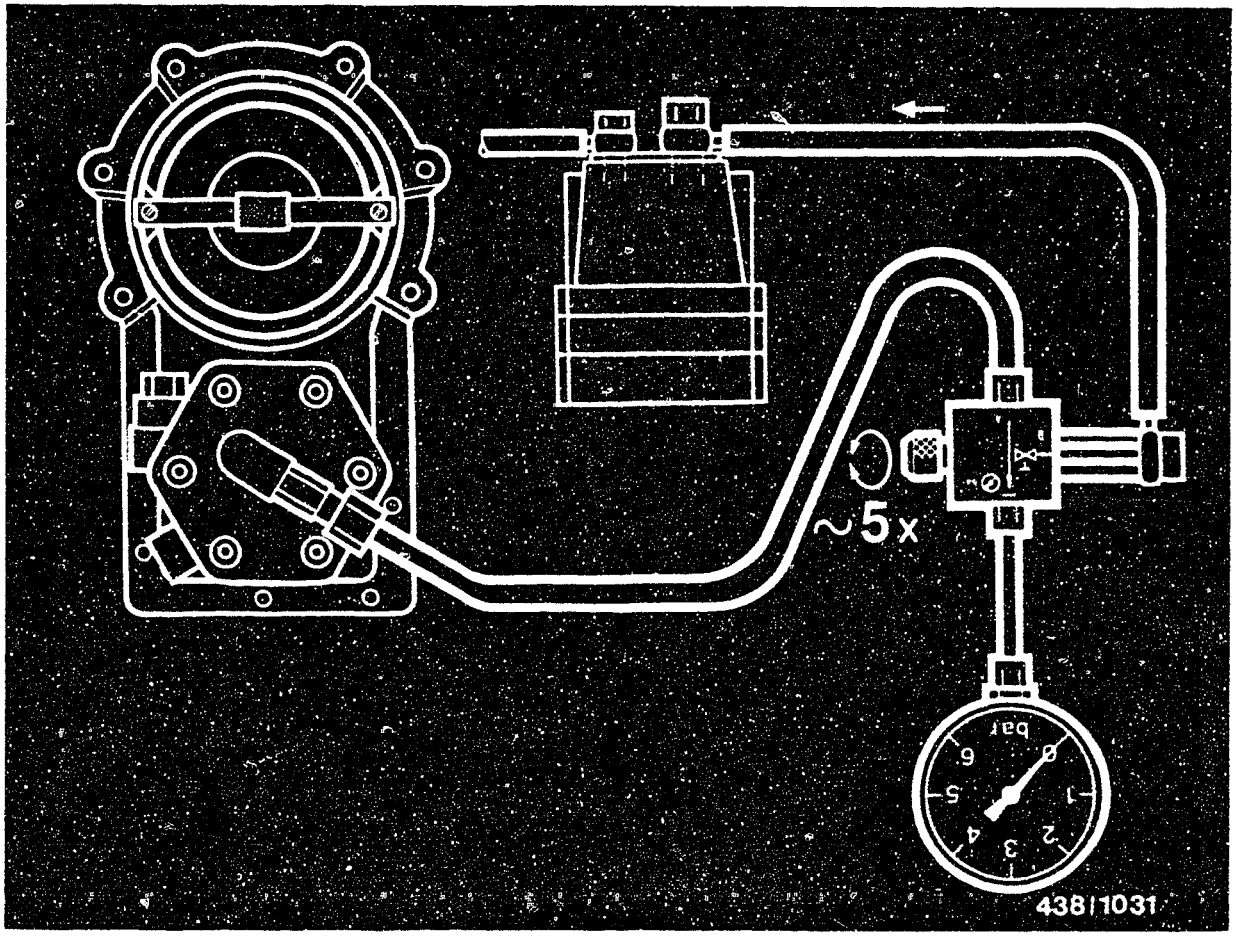
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributur to the warm-up regulator.

Mount with connecting-parts set KDJE-P 100/10.
Screw the adapter of the connecting-parts set with seal ring onto connection B or 1 of the directional-control valve (1).

Unscrew control-pressure line (to warm-up regulator) on fuel distributor and connect to adapter (2).
Screw connecting part of connecting-parts set into control-pressure connection port of fuel distributor (3) and connect by means of hose line (4) to connection A or 3 of the directional-control valve.



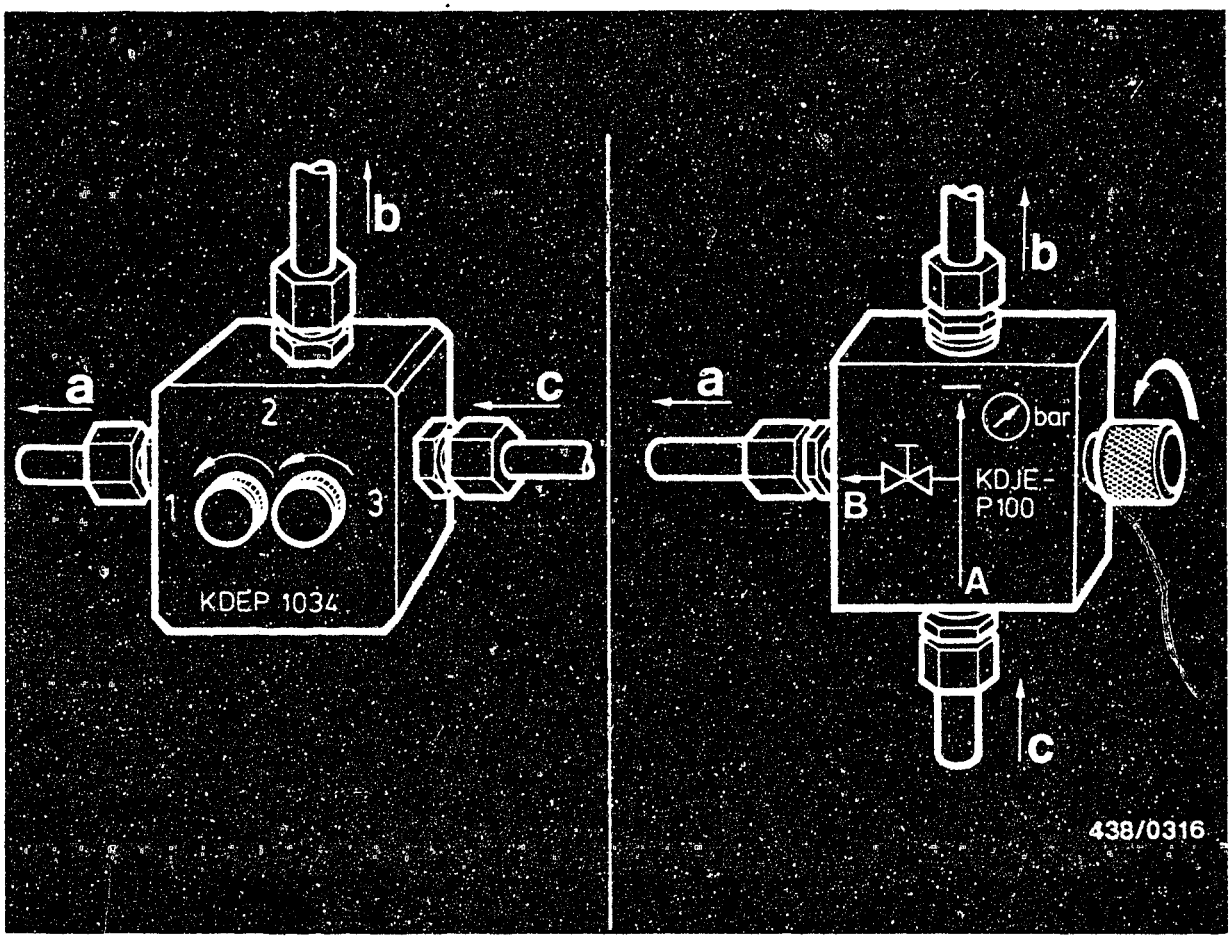
14.5 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



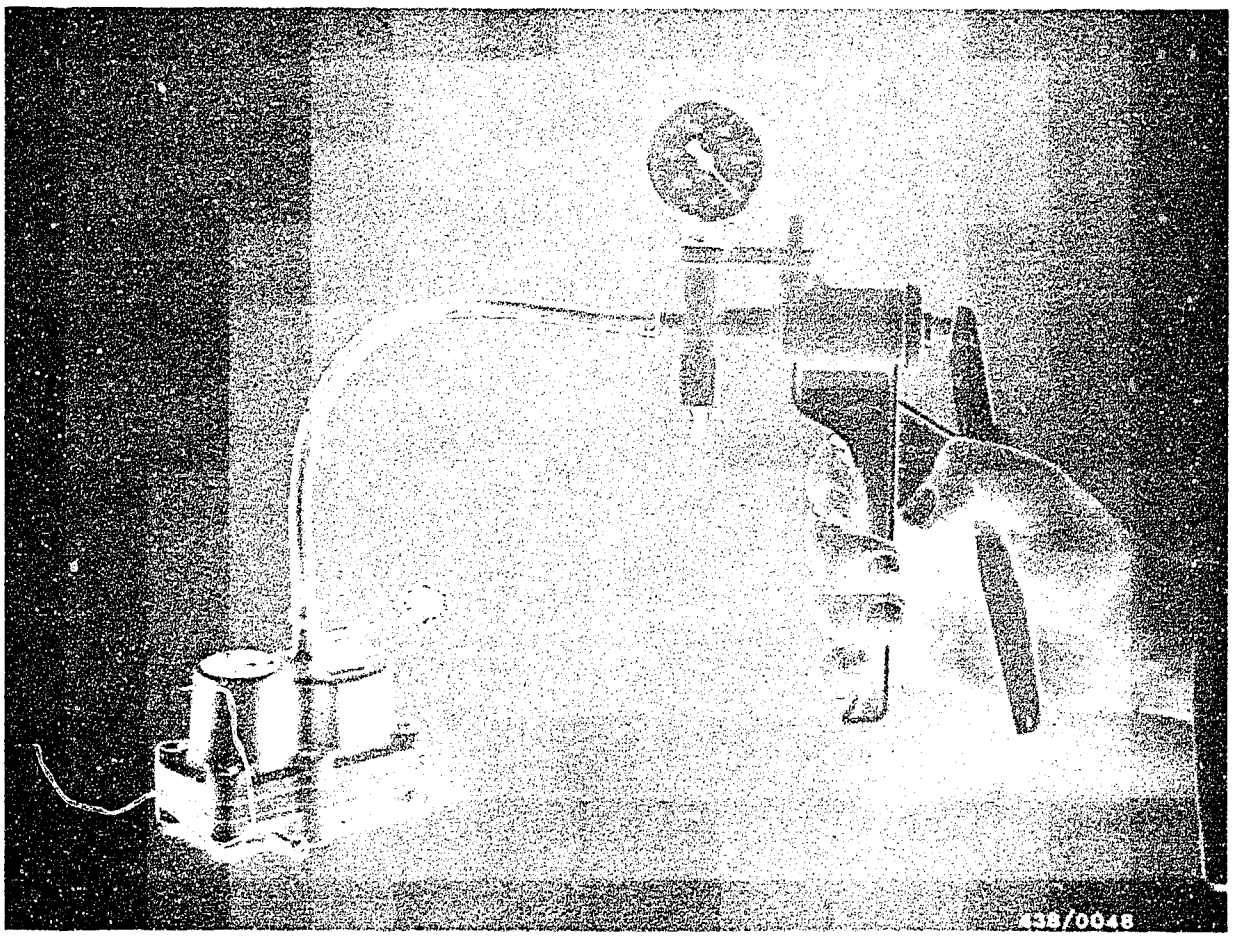
a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.6 Testing the "cold" control pressure:

Warm-up regulator: 0 438 140 018, ... 038

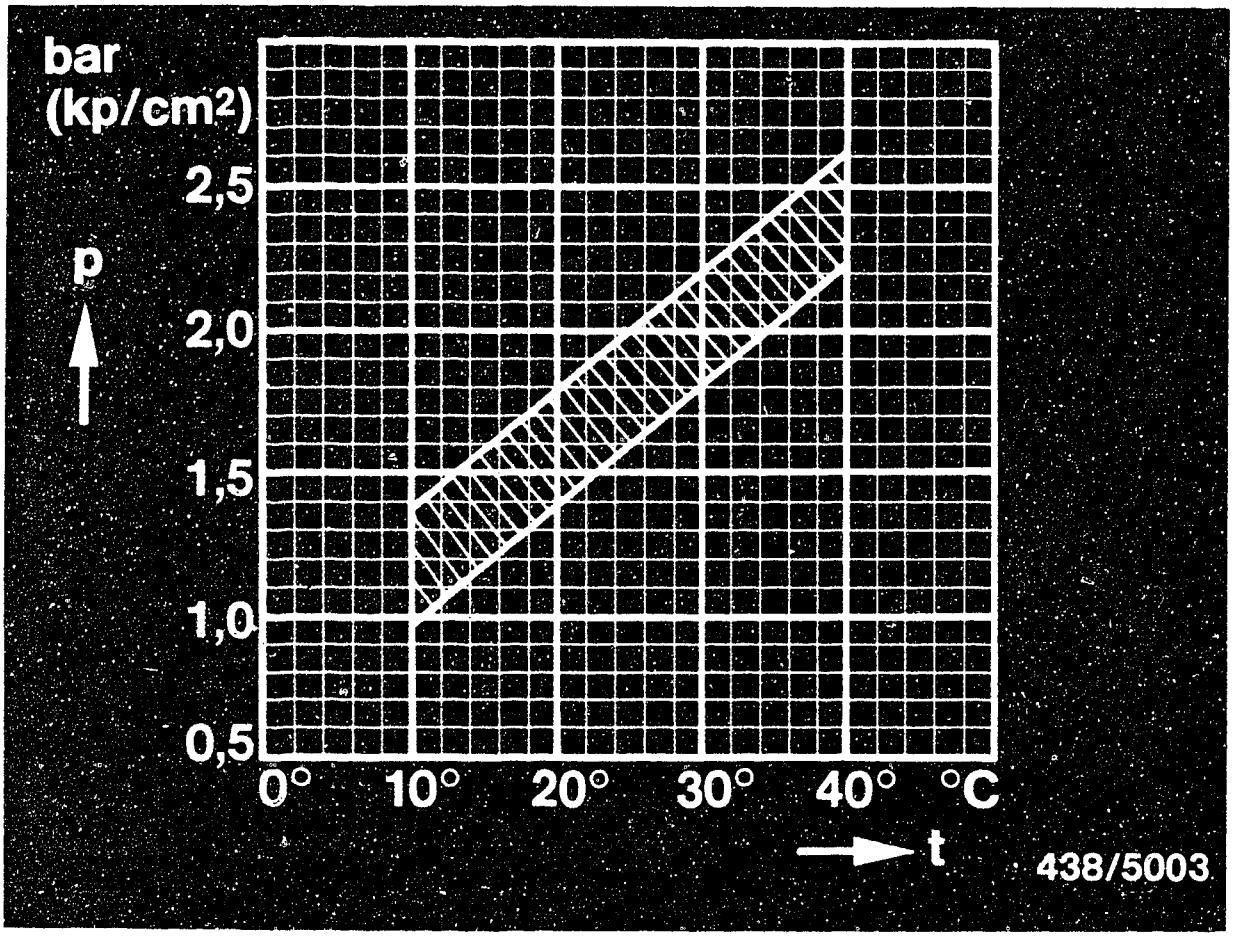
The test is performed with the engine switched off.
The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.
Pull off the plug from the warm-up regulator.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electrical safety circuit.

"Cold" control pressure is now indicated on the pressure gauge.



The control pressure is checked with simulated intake-manifold pressure, i.e. vacuum is applied to the warm-up regulator.
To do this, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator on the top of the housing. The picture shows testing with the recommended Mityvac hand vacuum pump.
Setting value for testing: 500...550 mbar
(375...412 mmHg)

The "cold" control pressure is indicated on the pressure gauge of the pressure tester.

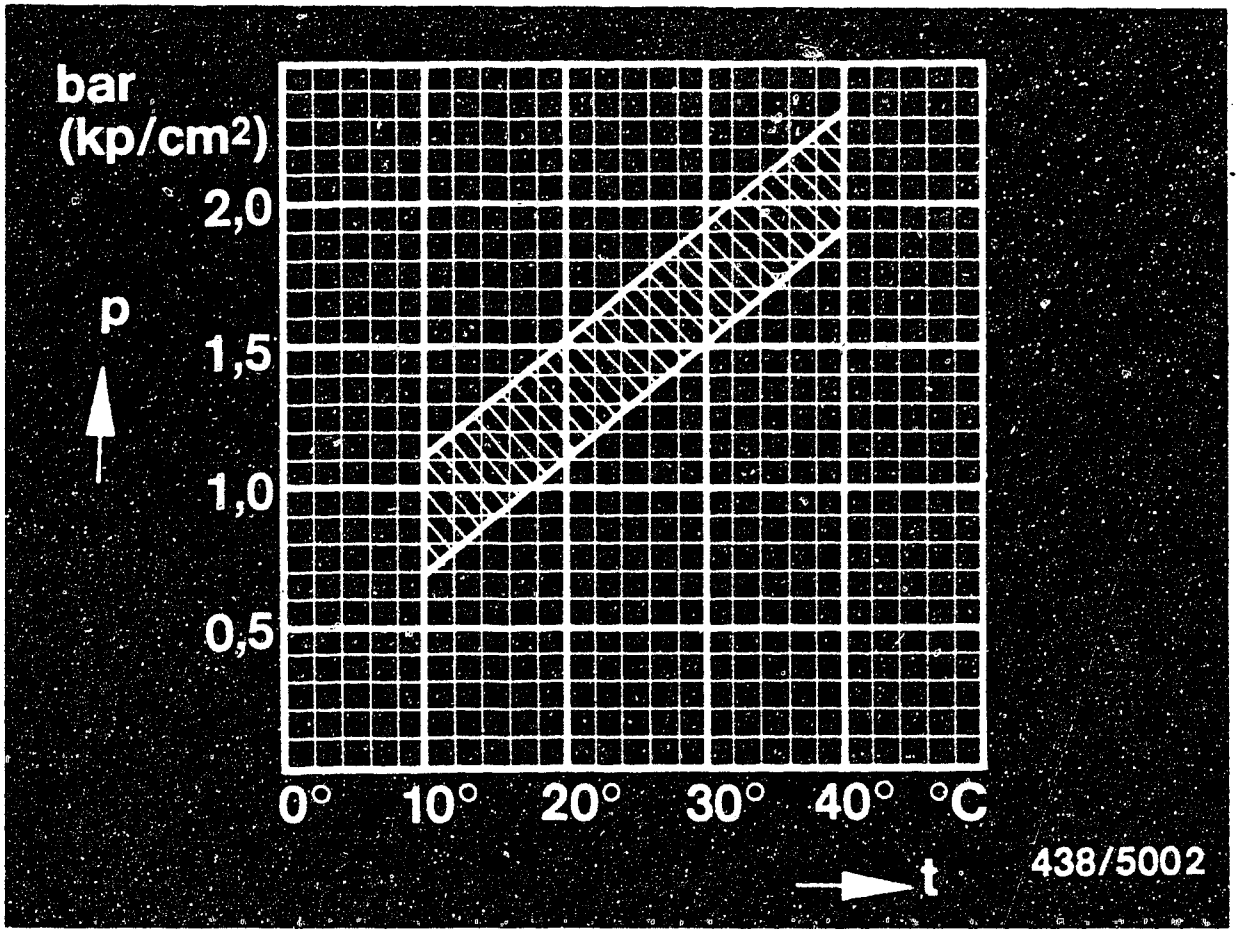


p = Control pressure (bar or kgf/cm^2 gauge pressure)
t = Ambient temperature (^{o}C)

Warm-up regulator Part No 0 438 140 018

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20^{o}C
Nominal control pressure = 1.4...1.8 bar gauge pressure



p = Control pressure (bar or kgf/cm^2 gauge pressure)
t = Ambient temperature (^{o}C)

Warm-up regulator Part No.: 0 438 140 038

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20^{o}C
Nominal control pressure = $\frac{1,1...1,5 \text{ bar}}{\text{gauge pressure}}$

If the measured "cold" control pressure differs from the nominal value, this may be due to one of the following faults:

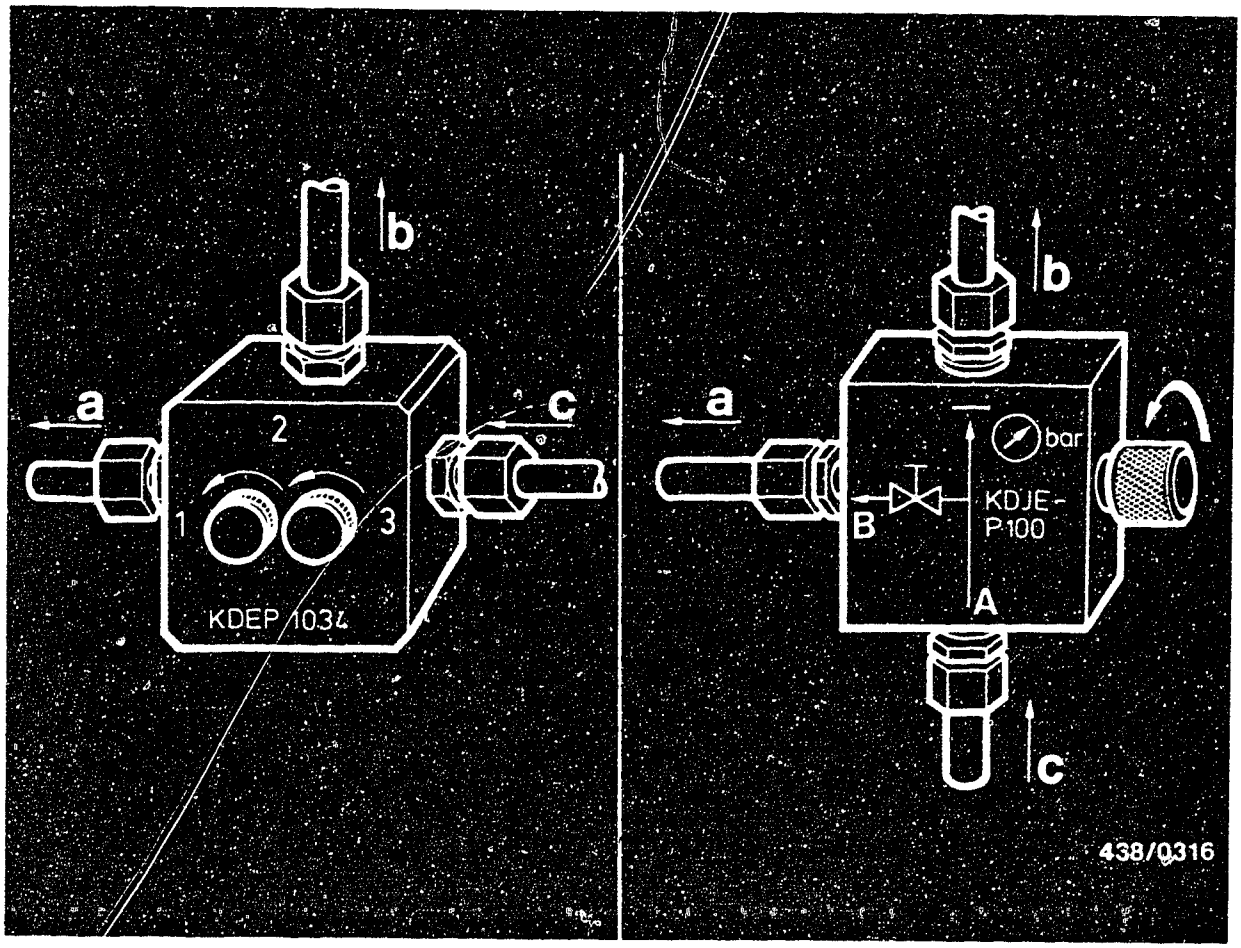
- Fuel delivery for the control-pressure circuit too low or too high.
  Test fuel delivery.
  Test value: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted (if control pressure too high).
  Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.

If the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on Coordinate G 7.



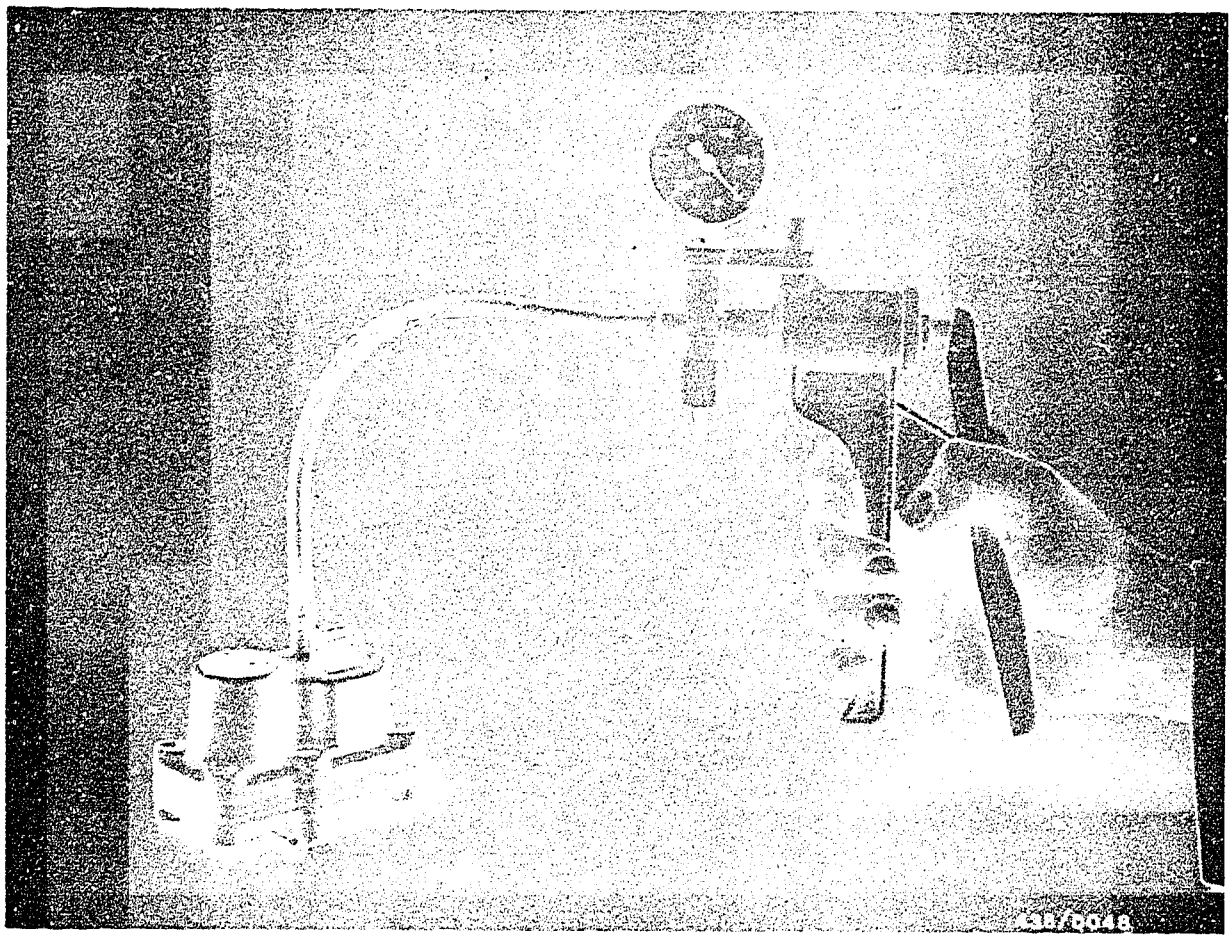
a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

Checking the "warm" control pressure

Warm-up regulator Part No.: 0 438 140 018, ... 038

The test is performed with the engine switched off, once without intake-manifold pressure being applied, once with simulated intake-manifold pressure (vacuum) applied.

Open the valve screw of the directional-control valve (or both valves in the case of KDEP 1034).



- Warm-up regulator Part No. 0 438 140 005

For testing with simulated intake-manifold pressure, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator (on top of the housing, next to the plug housing).

The picture shows the recommended Mityvac hand pump.

Setting value for the test 500...550 mbar
(375...412 mmHg)

Test procedure:

The temperature of the engine is not important.
Open the valve screw of the directional-control valve (both in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electrical safety circuit.

Plug the plug onto the warm-up regulator.
The control pressure increases (warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

Test first of all without the application of intake-manifold pressure, then test with simulated intake-manifold pressure (vacuum) in accordance with the values given below:

Test step	Test specifications*
"Warm" control pressure Part No. of warm-up regulator: 0 438 140 018, ... 038	
• Test with atmospheric pressure (without vacuum)	3,0...3,4 bar (3,1...3,5 kgf/cm²)
• For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator. Setting value: 500...550 mbar (375...412 mmHg)	3.4...3.8 bar (3.5...3.9 kgf/cm²)

*Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm² (gauge pressure).

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

If control pressure too high:

- Fuel delivery for the control-pressure circuit too high.
  Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted. Eliminate constriction.

- Warm-up regulator has hydraulic defect.
  Replace warm-up regulator.

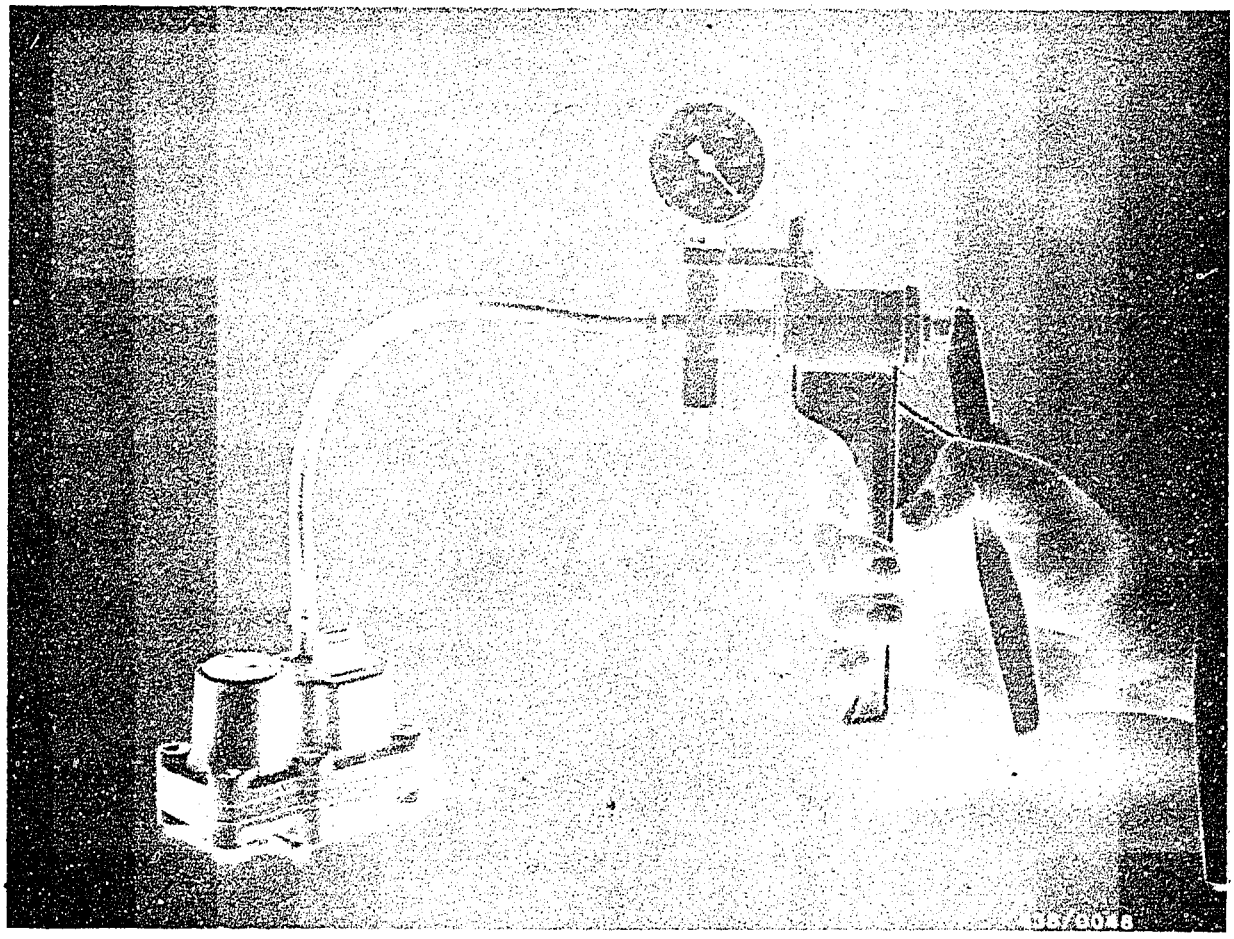
If control pressure too low:

- Power supply open-circuit.
  Eliminate open circuit. Ensure that the plug is contacting properly.

- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
  If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.

- Fuel delivery for the control-pressure circuit too low.
  Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Warm-up regulator defective. Heating coil open-circuit. Hydraulic defect. Replace warm-up regulator.



- Testing the full-load diaphragm for leaks

Switch off the electric fuel pump.
Connect the "Mityvac" hand vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator and build up a vacuum.

Setting value: 510...550 mbar (385...415 mmHg).

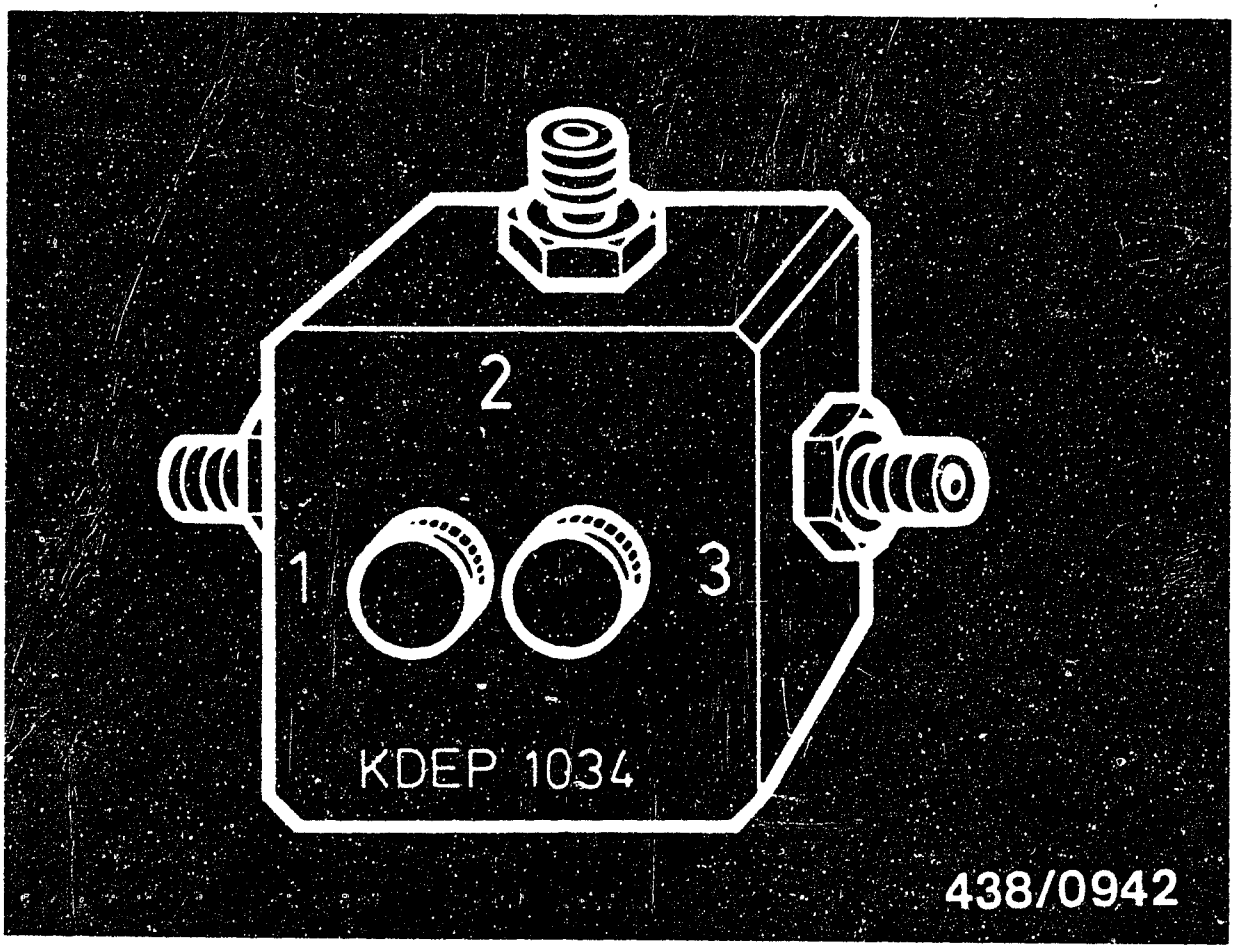
Max. pressure drop within 15 s 100 mbar (75 mmHg).
If the pressure drop is too great, replace the warm-up regulator.

Note:

Incorrect control-pressure functions during vehicle operation may also be due to a malfunction in the intake-manifold pressure control system for the warm-up regulator. Therefore, check the condition and correct fitting of the connecting hose from the intake manifold to the warm-up regulator. Check the system with the engine running and when warmed-up. This test is best combined with the final idle adjustment.

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

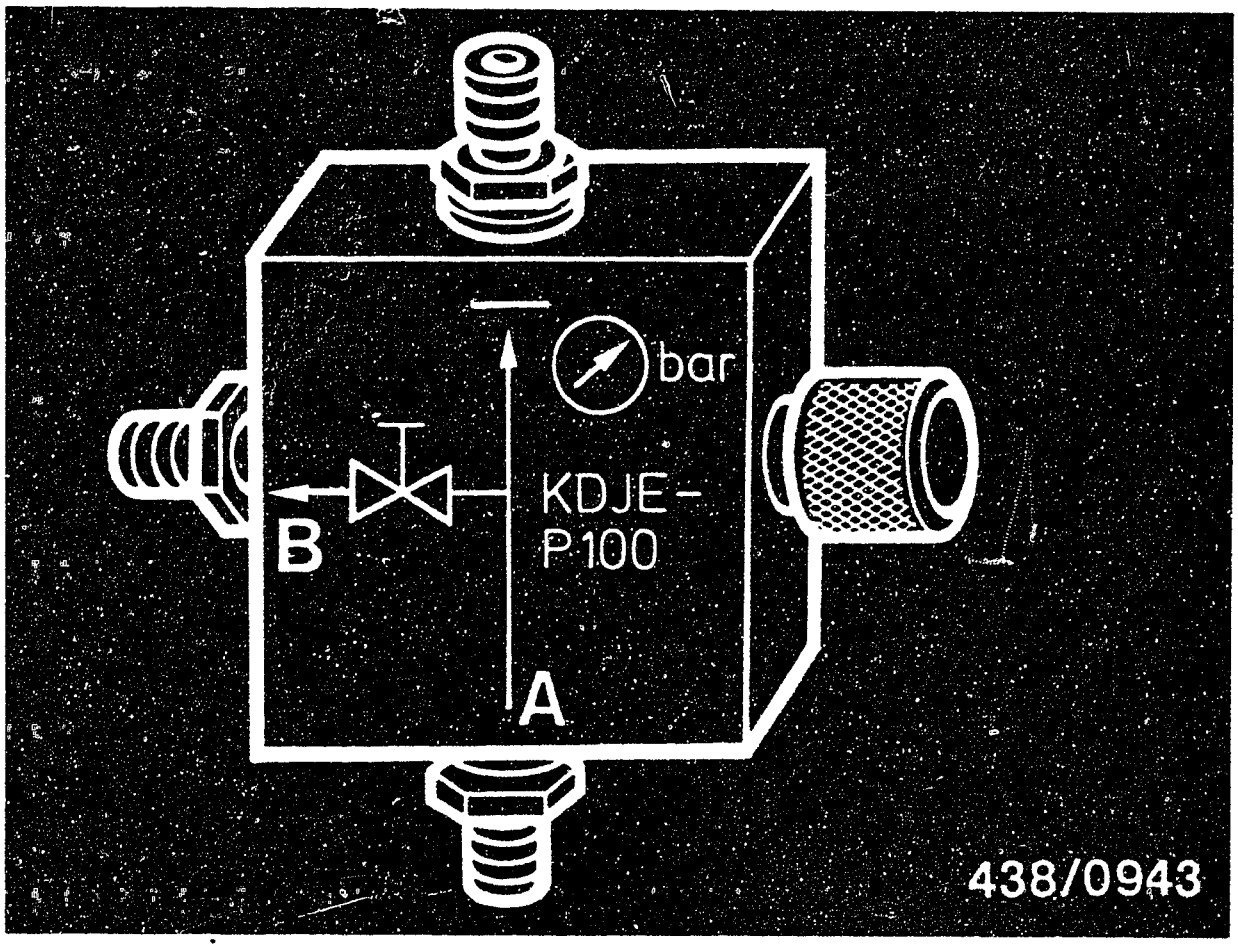
Idle adjustment is described on Coordinate G 7.



15. Testing and adjusting the primary (system) pressure:

15.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

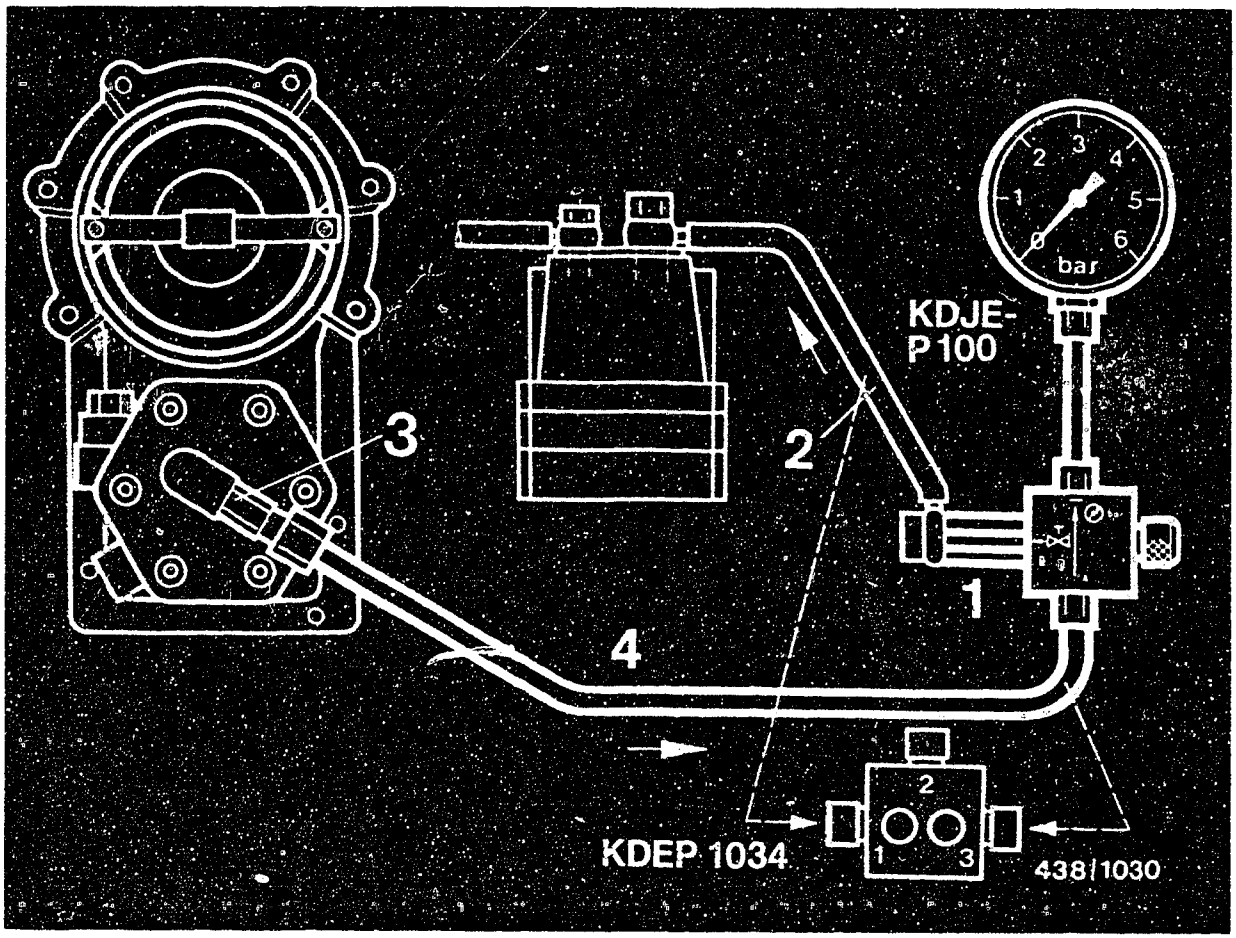
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered.



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw. The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

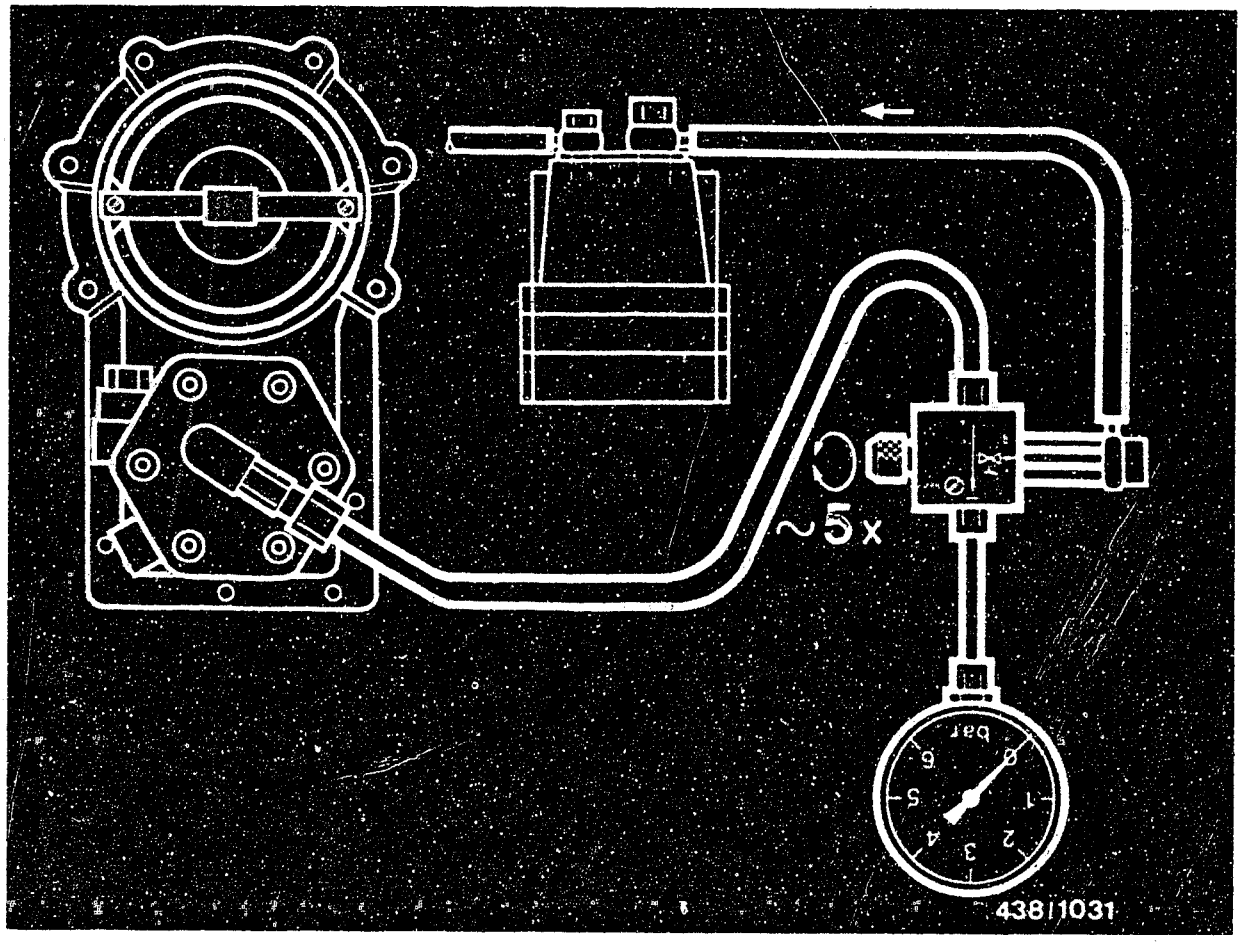
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Mount with connecting-parts set KDJE-P 100/10.
Screw the adapter of the connecting-parts set with seal ring onto connection B or 1 of the directional-control valve (1).

Unscrew control-pressure line (to warm-up regulator) on fuel distributor and connect to adapter (2).
Screw connecting part of connecting-parts set into control-pressure connection port of fuel distributor (3) and connect by means of hose line (4) to connection A or 3 or the directional-control valve.



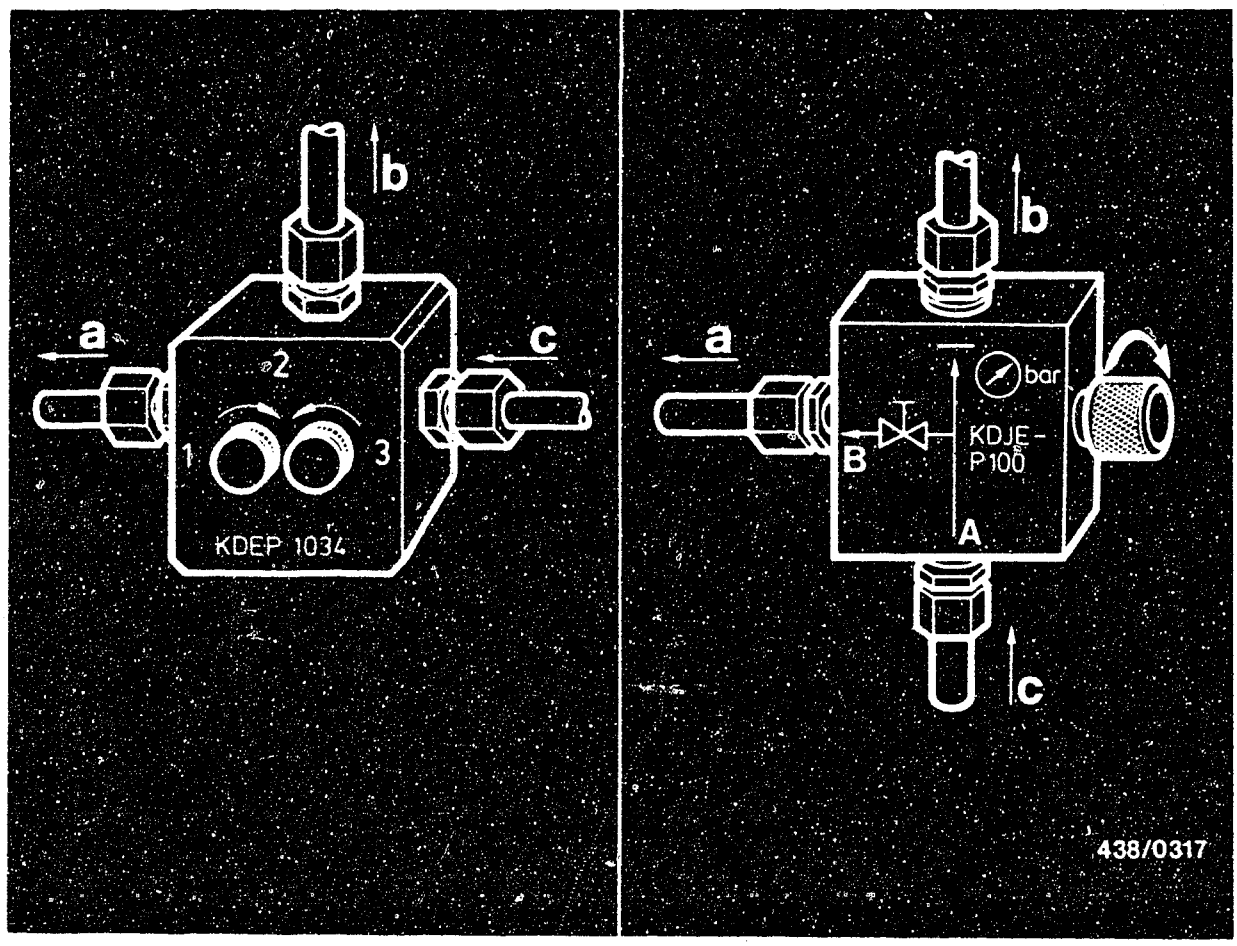
15.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electrical fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure:

The test is performed with the engine switched off. The temperature of the engine is not important.

Close the valve screw of directional-control valve KDJE-P 100. In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Switch on the electric fuel pump by bridging the electrical safety circuit.

The pressure gauge now indicates the primary pressure.

Fuel distributor Part No.	Test specifications - primary pressure (gauge pressure)
0 438 100 035	4.5...5.2 bar (4.6...5.3 kgf/cm^2)

Possible causes for too low a primary pressure:

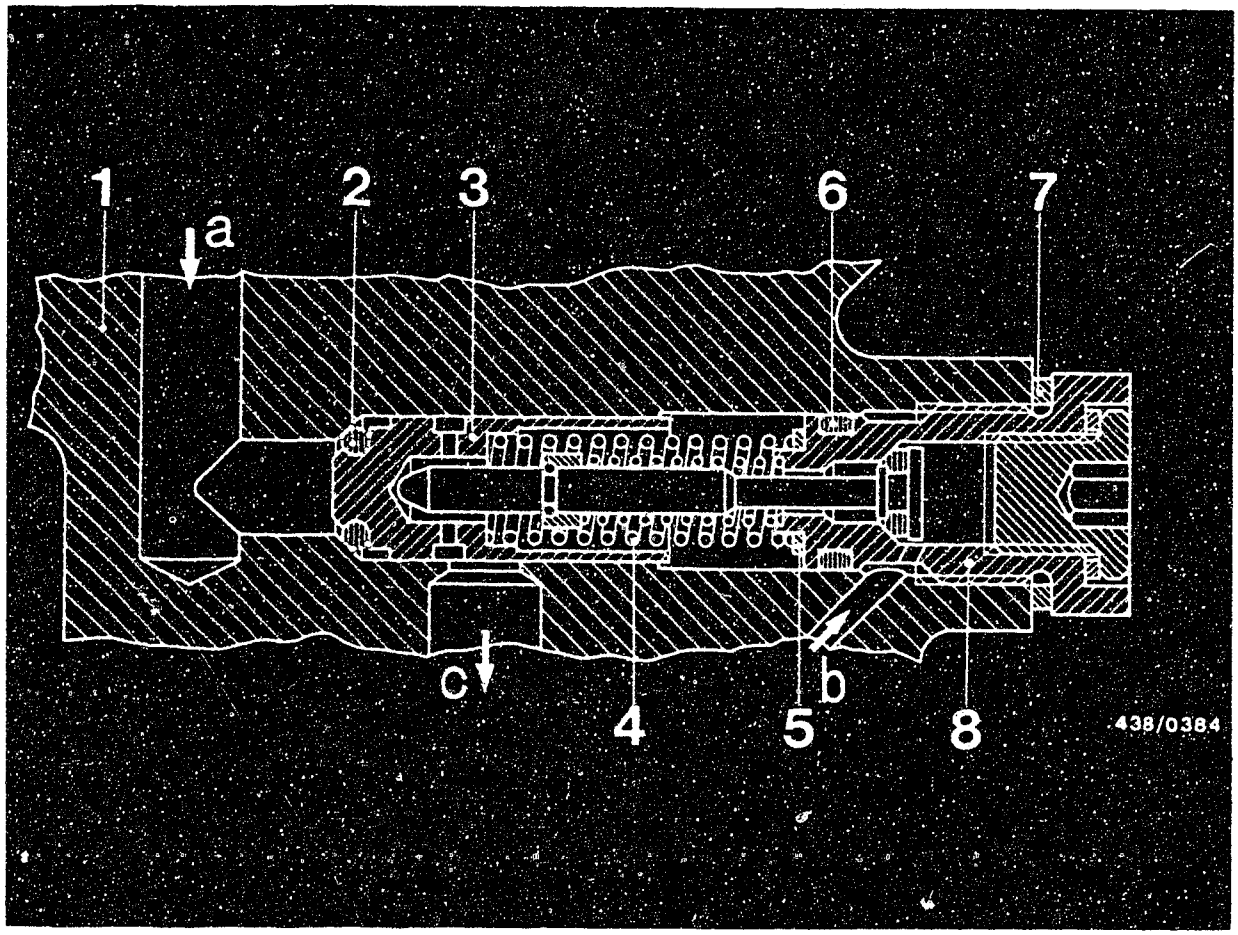
- Fuel supply faulty.
  (Delivery of electric fuel pump too low).

- Primary pressure set incorrectly.
  A precondition for readjustment of the primary pressure is always that the fuel supply is in order. Measure the fuel delivery. Test specification: 850 cm^3/30 s.

Possible causes for too high a primary pressure:

- A restriction in the return line leading to the fuel tank.

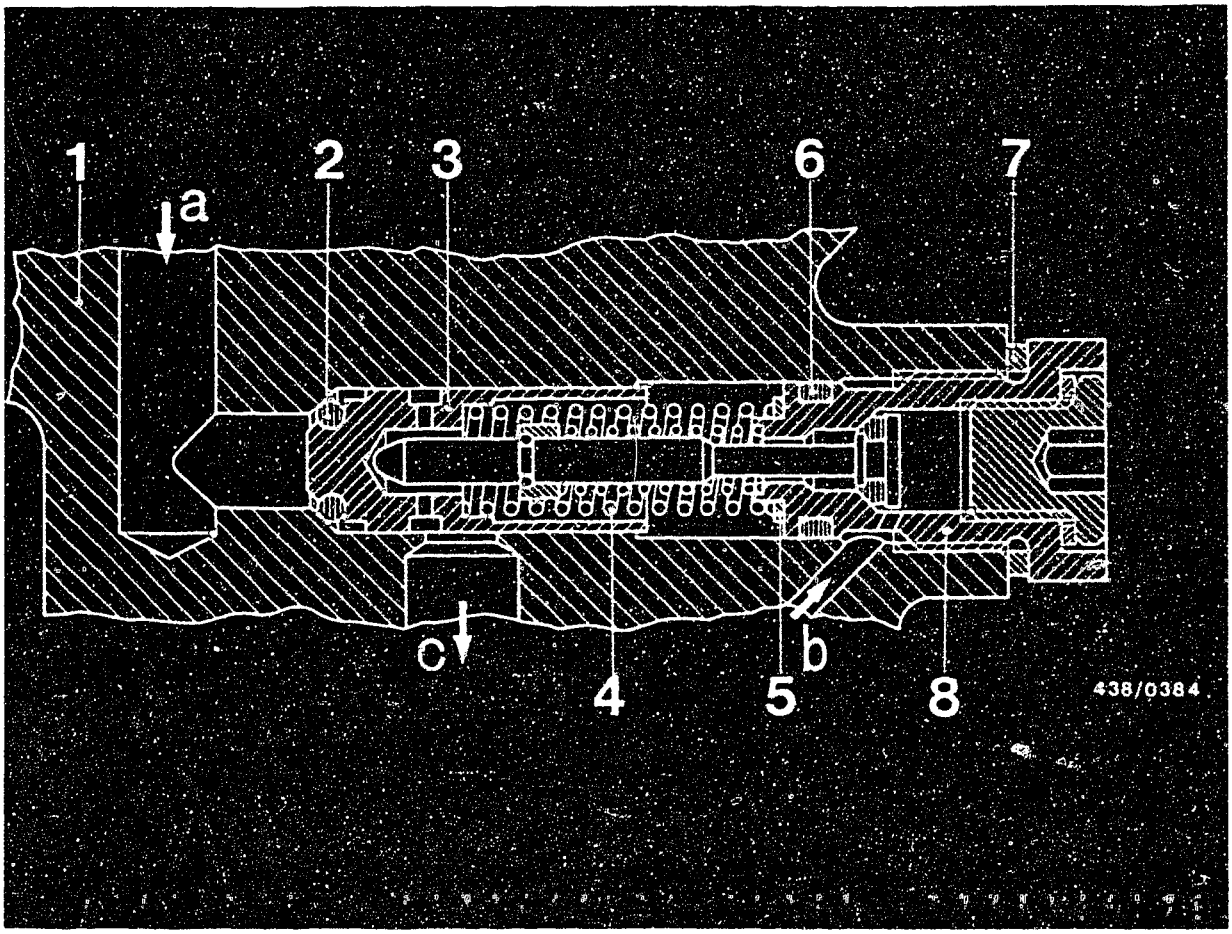
- Primary-pressure regulator set incorrectly.
  A precondition for readjustment of the primary pressure is always that the fuel supply is in order. Measure the fuel delivery. Test specification: 850 cm^3/30 s.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

15.4 Adjusting the primary pressure:

Fuel distributor Part No.	Adjustment values - primary pressure (gauge pressure)
0 438 100 035	4.7...4.9 bar (4.8...5.0 kgf/cm^2)

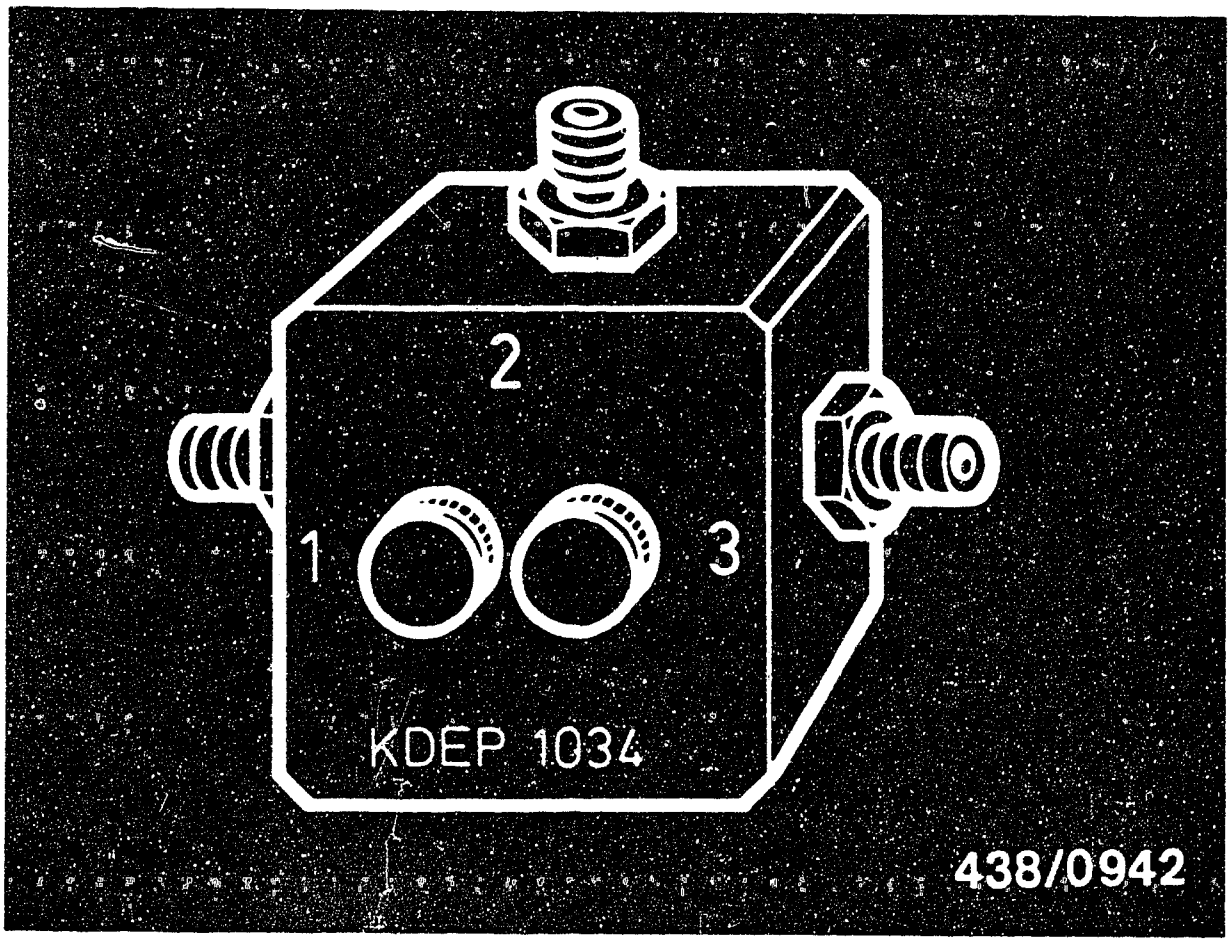


The primary pressure is readjusted by replacing the shims (Item 5).

Note:
0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 8) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 7) and O-ring (Item 6).

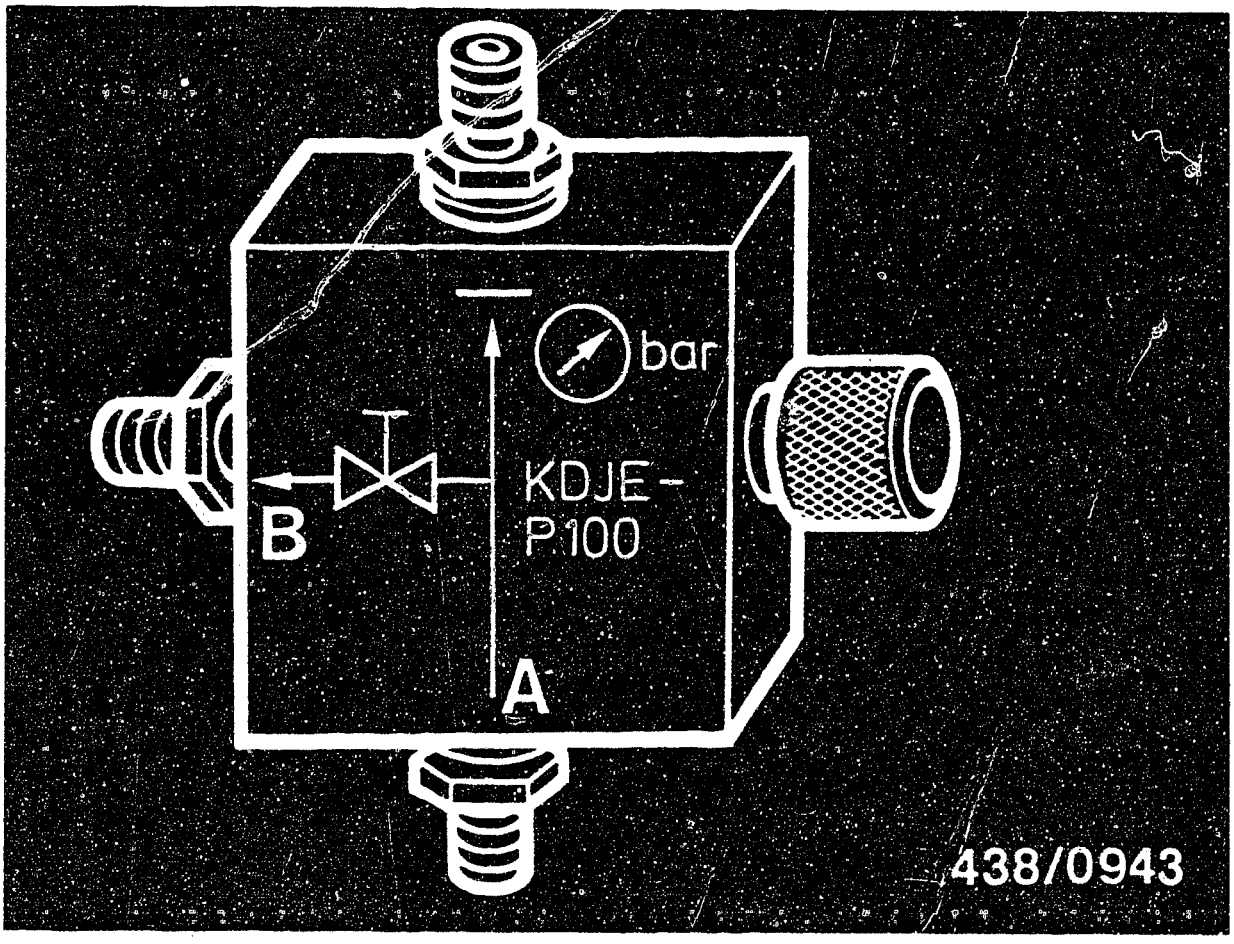
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



16. Testing the entire fuel system for leaks.

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered.

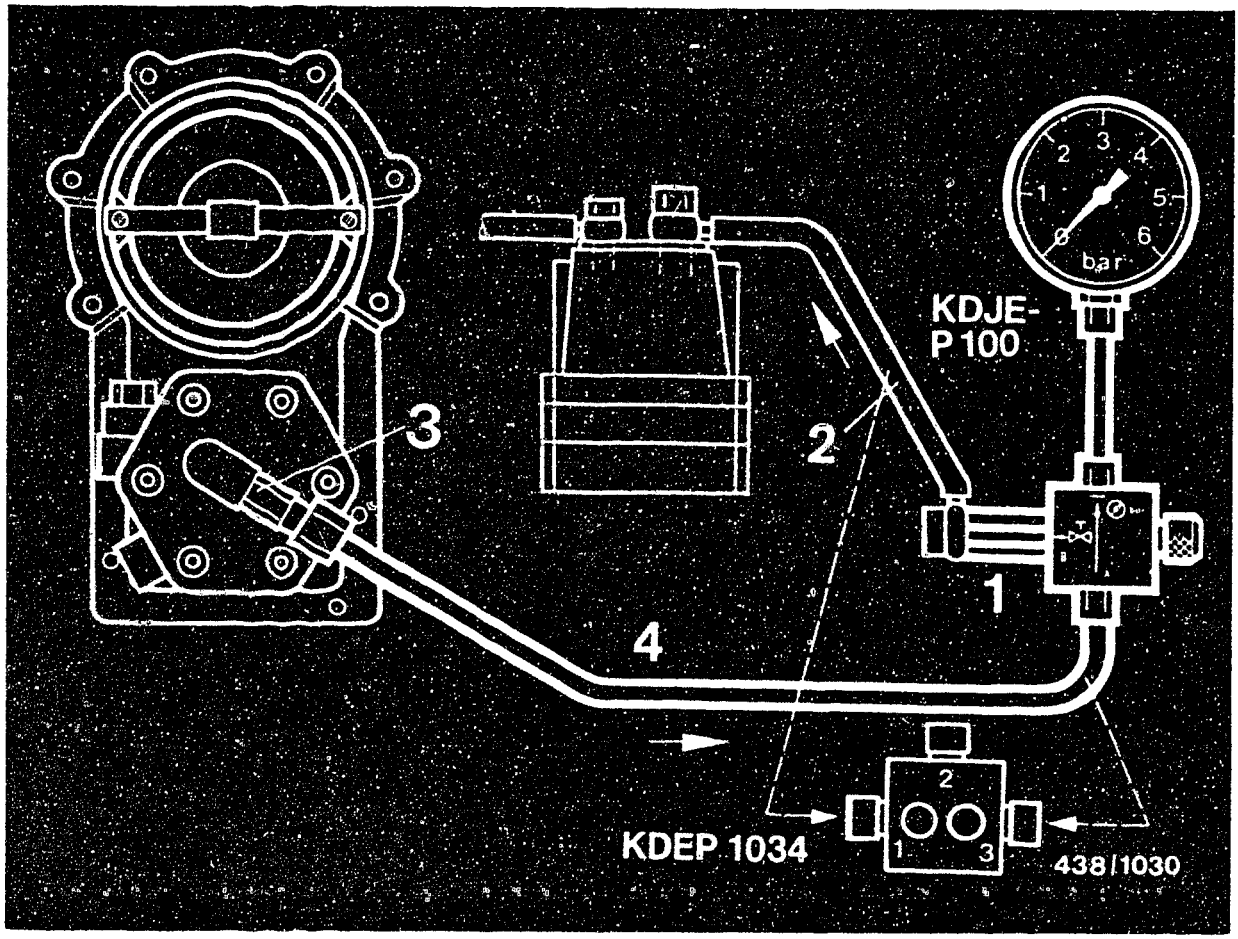


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw. The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

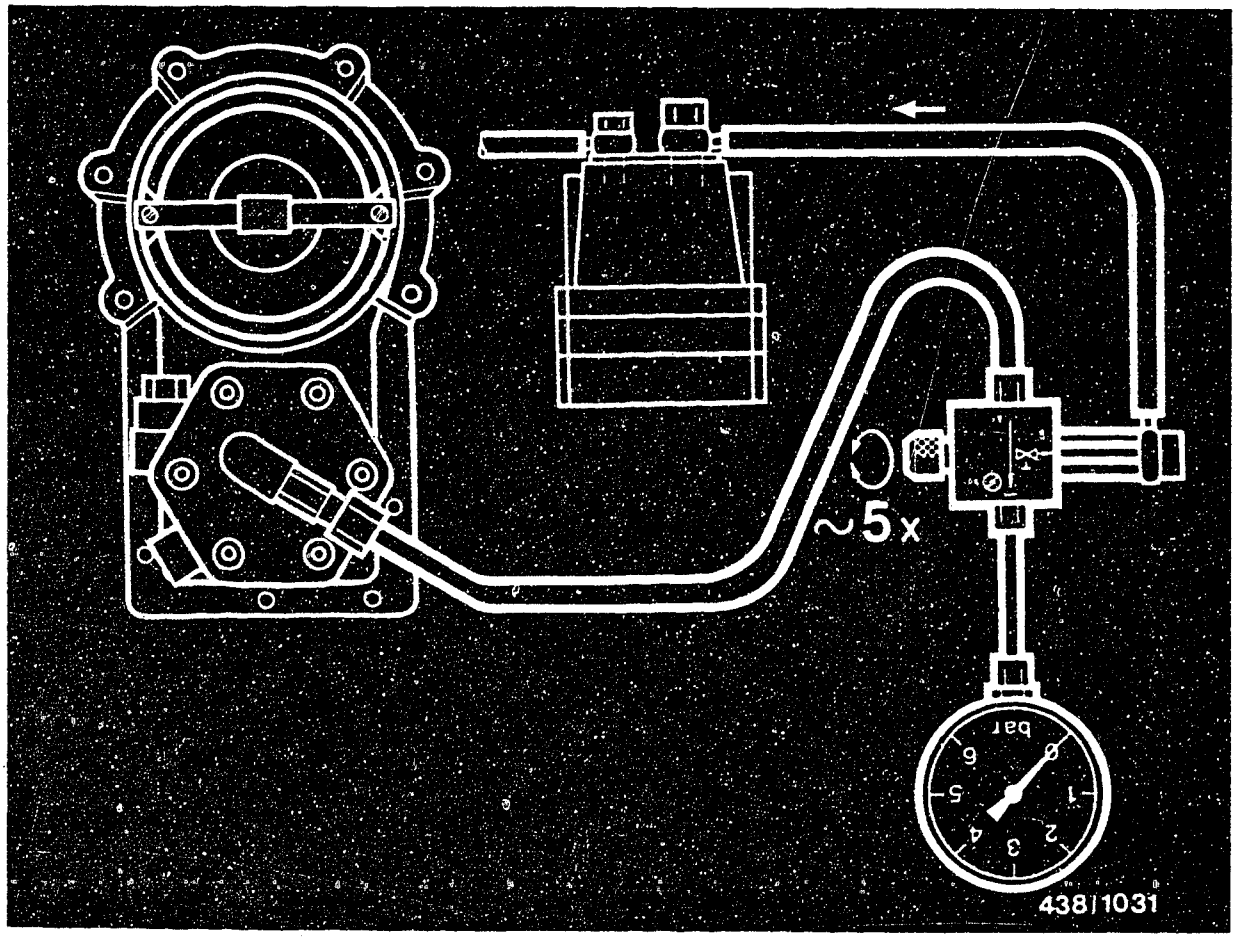
Caution:

When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.
The connecting-parts set KDJE-P 100/10 is required.
Screw the adapter of connecting-parts set with seal ring onto connection port B or 1 of the directional-control valve (1).

Unscrew control-pressure line (to the warm-up regulator) from the fuel distributor and connect it to the adapter (2). Screw the connecting piece of the connecting-parts set to the control-pressure connection port of the fuel distributor (3) and connect it with connection port A or 3 of directional-control valve via connecting hose (4).



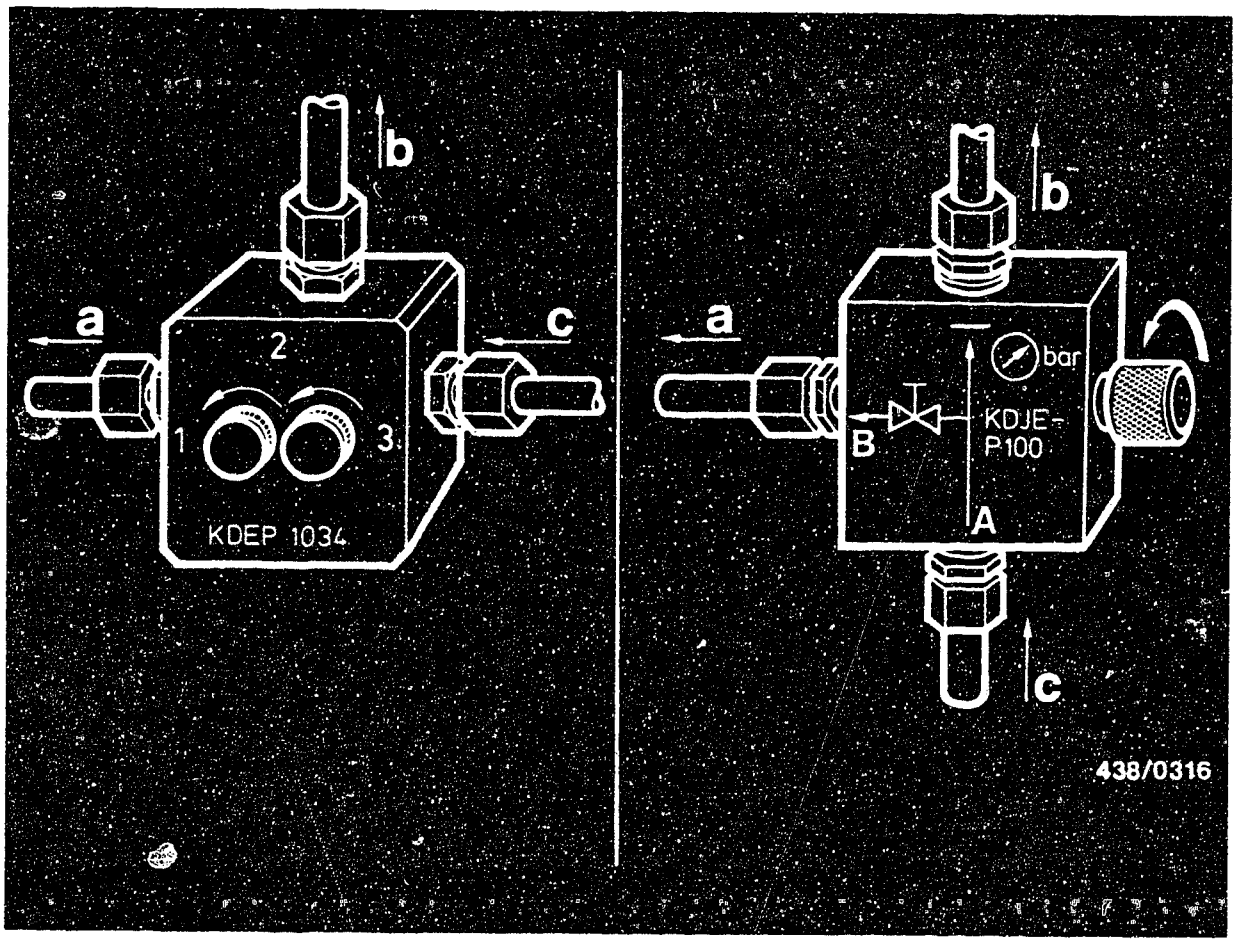
16.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

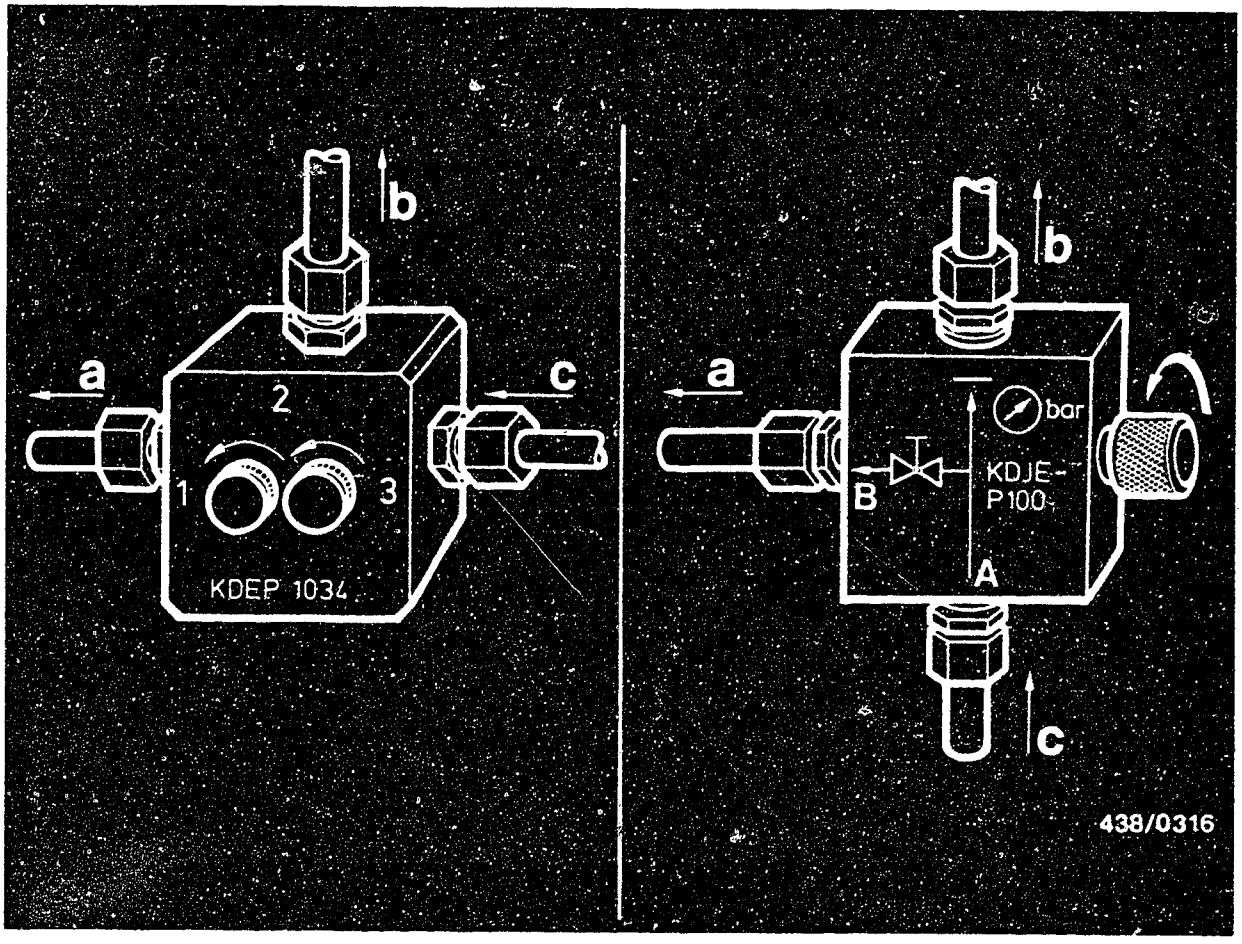
Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test

The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

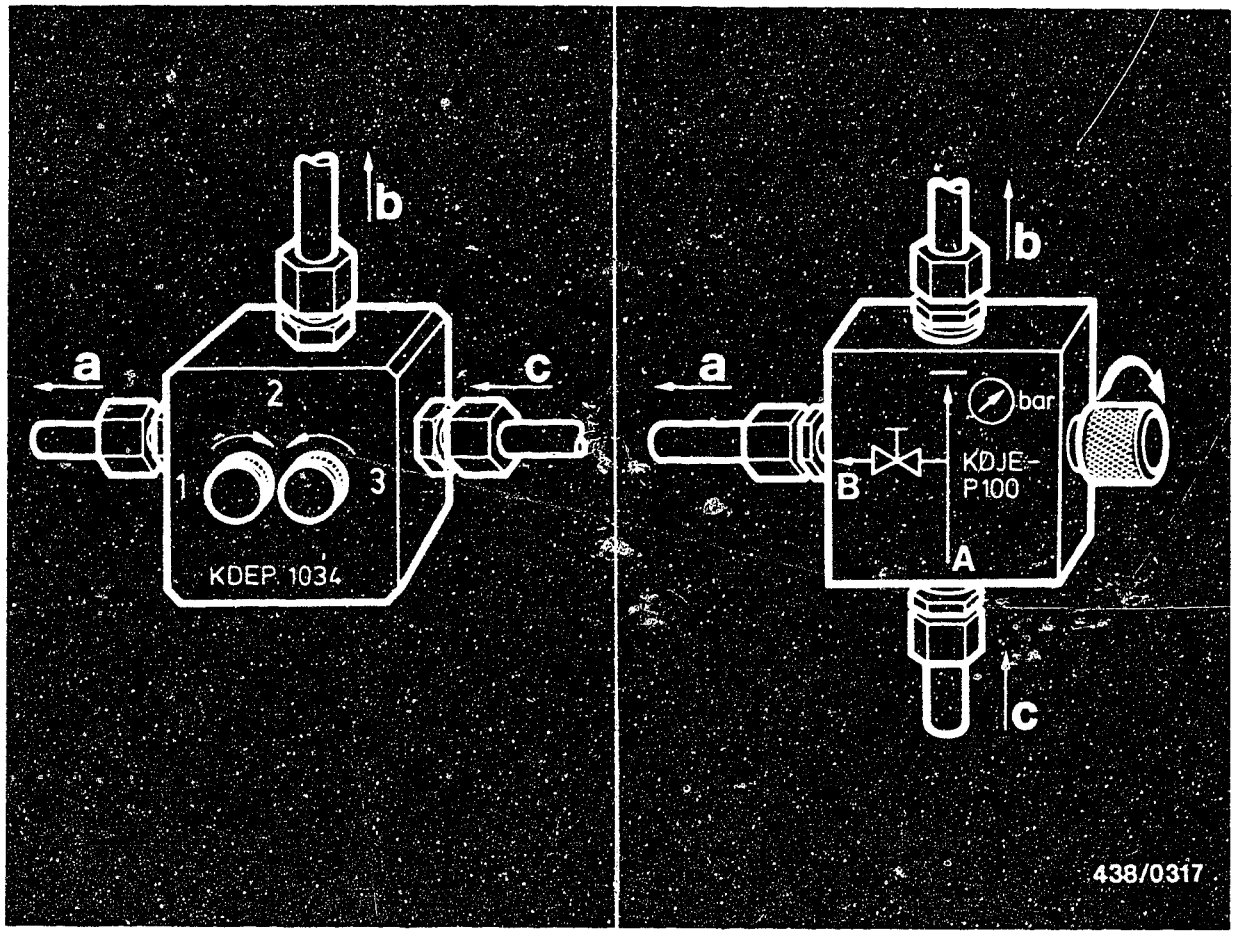


Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

Test specifications for leak test:

Minimum pressure (gauge pressure)
after 10 minutes: 2.0 bar (2.1 kgf/cm^2)
after 20 minutes: 1.7 bar (1.8 kgf/cm^2)

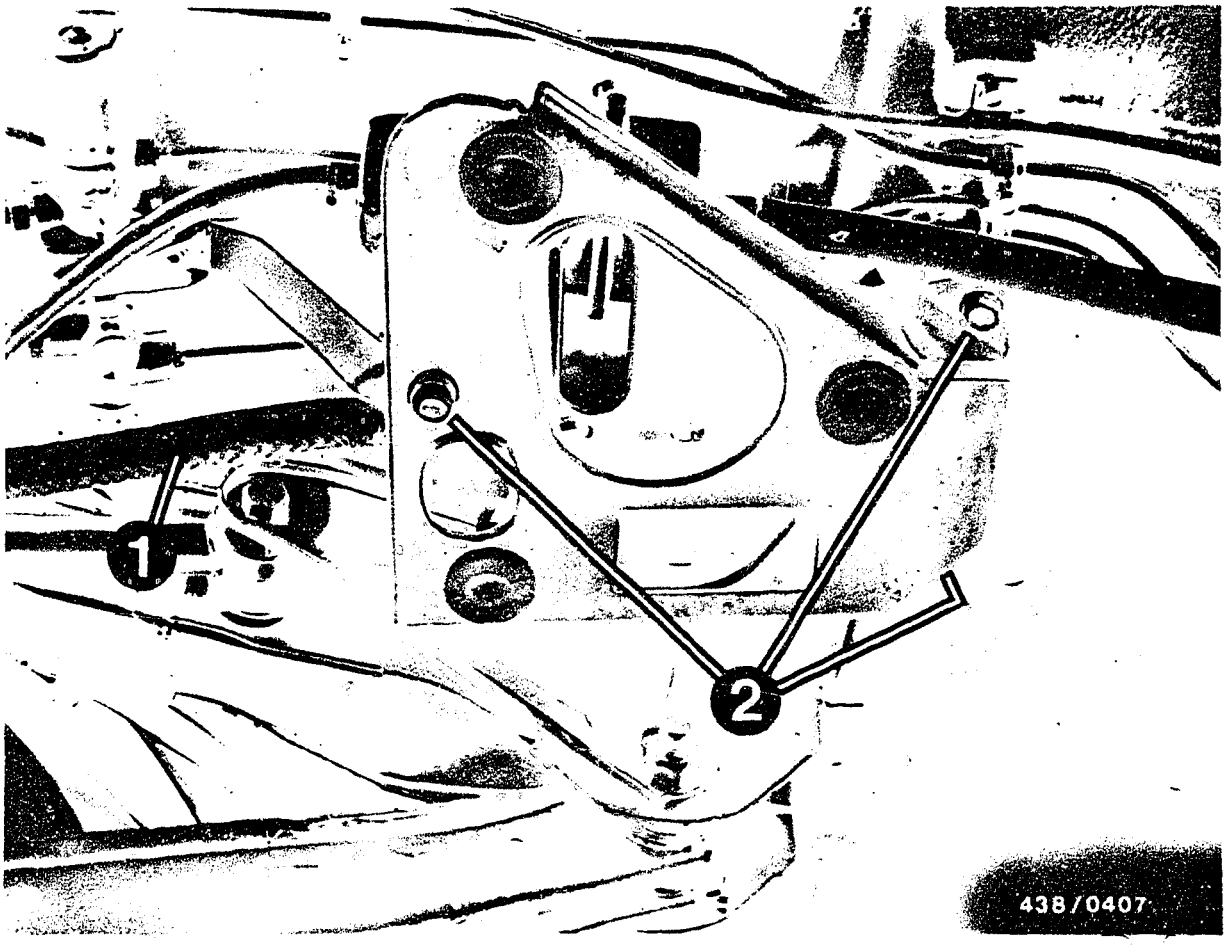


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.

If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.



1 = Intake hose 2 = Fastening screws

16.4 Possible causes of faults in the primary-pressure circuit:

- Non-return valve in the tube fitting of the electric fuel pump leaking.

  Part no. of electric fuel pump:

  1979 model = 0 580 254 996
  as of 1980 model = 0 580 254 972

The non-return valve is integrated in the tube fitting on the delivery side of the pump. If leaking, replace the tube fitting.

Part number of tube fitting:

For pump 0 580 254 996 = 1 583 386 011
Special seal ring = 1 580 203 001

For pump 0 580 254 972 = 1 583 386 016
Seal ring = 1 580 105 001

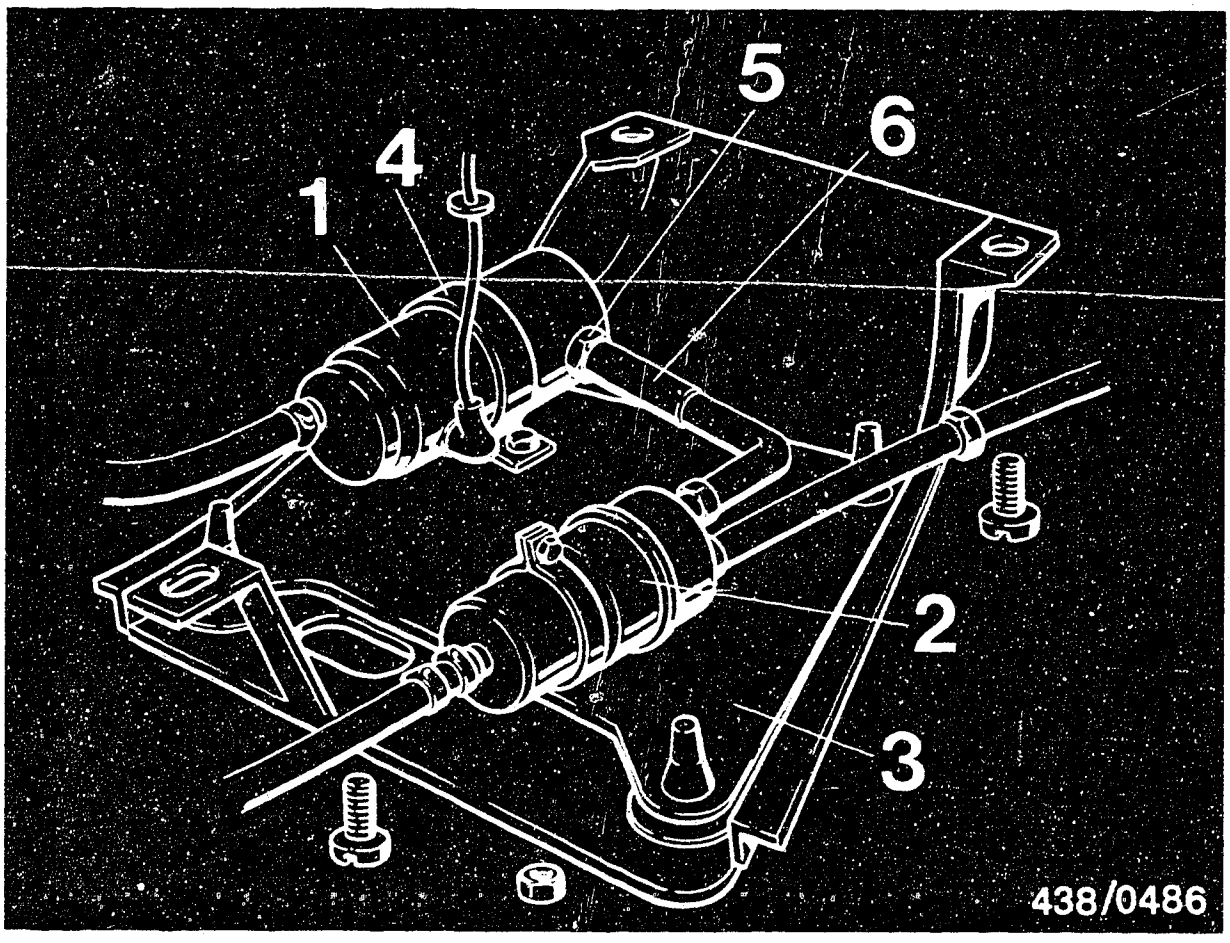
In order to make the electric fuel pump accessible, remove the bracket as follows:

Pinch off the intake hose (1) (e.g. using hose clamper W 157 from Matra Co.) so that no fuel can escape from the fuel tank.

Loosen the hose clip and remove the intake hose from the intake fitting on the electric fuel pump.

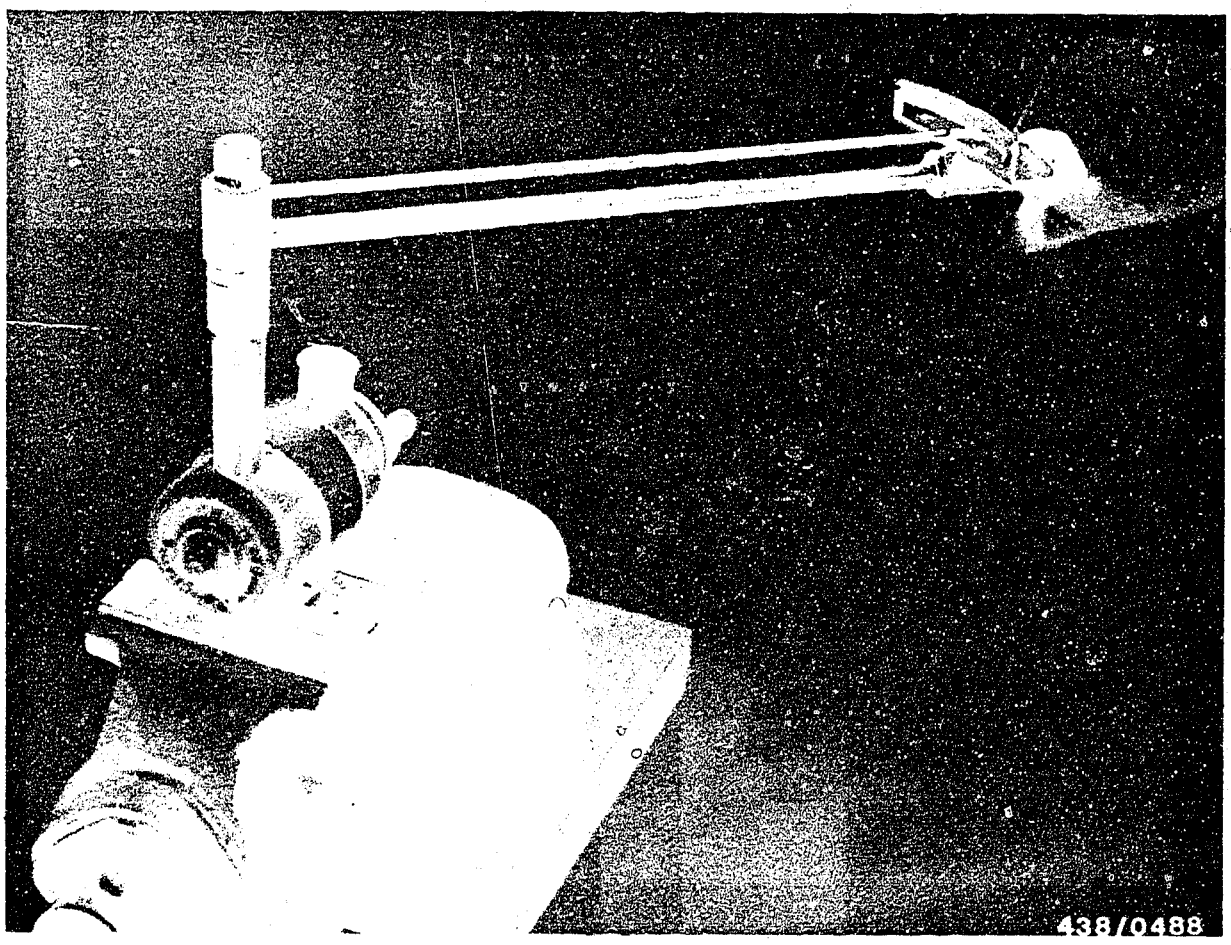
Remove the complete bracket by loosening the 3 fastening screws (2, one of the screws not visible in the picture) and hold slightly downward with the accumulator lines connected. Make sure that the lines still connected are not damaged.

The removal and installation of the tube fitting is different for the two versions of pump and is described below.



1 = Electric fuel pump
2 = Fuel accumulator
3 = Bracket
4 = Clamping clip
5 = Delivery fitting with non-return valve
6 = Delivery line

Replacing the tube fitting with non-return valve in the case of electric fuel pump 0 580 254 996 in the 1979 model (pump type EKP I with steel housing and lateral tube fitting):
Remove the complete electric fuel pump. To do this, unscrew the delivery line (6) from the accumulator (2). Screw off the clamping clip (4) and remove the pump from the bracket.

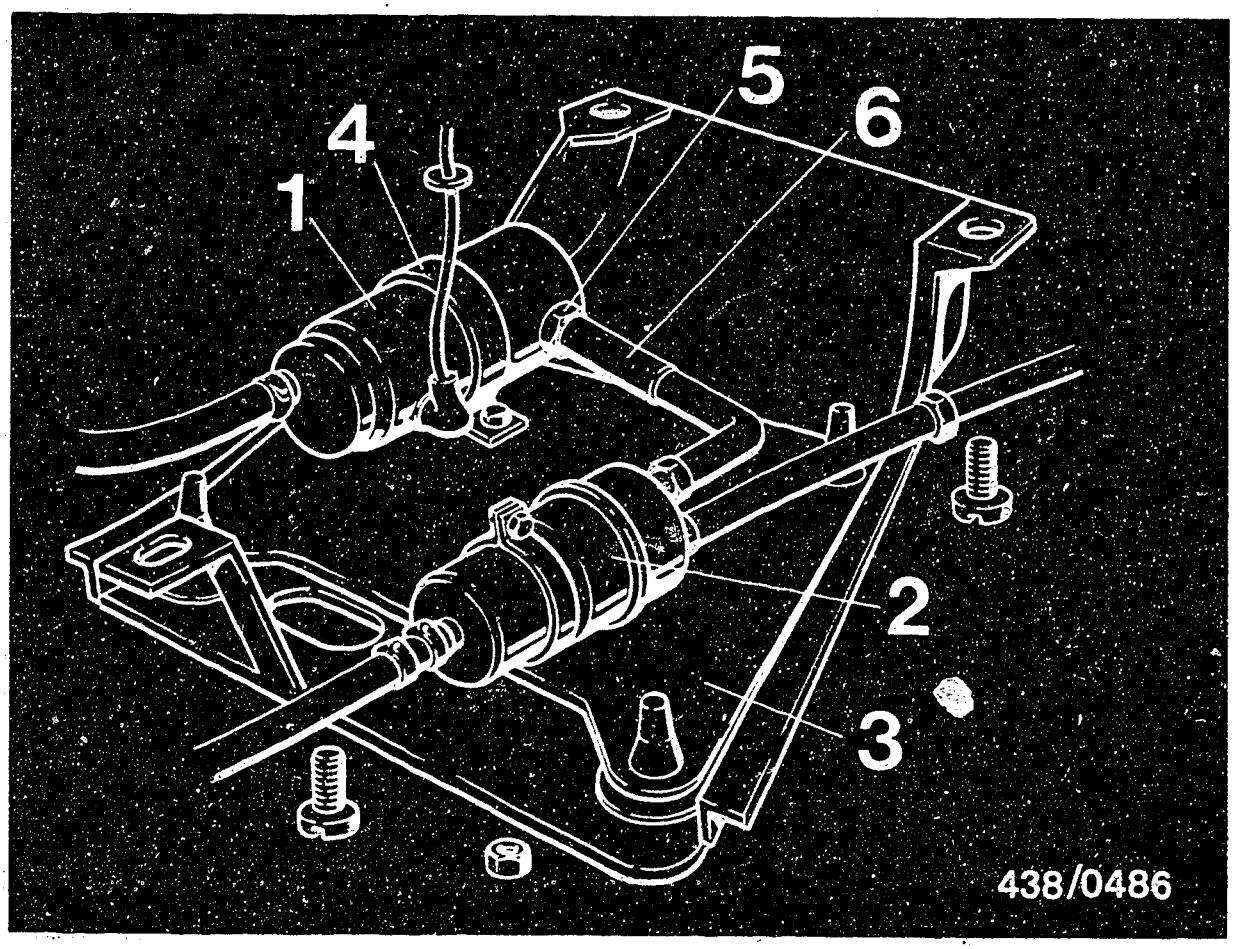


Clamp the pump in a vise by the clamping clip (never clamp by the pump housing). Remove the delivery hose from the tube fitting and screw off the fitting.

Caution: No dirt or chips must get into the inside of the pump.

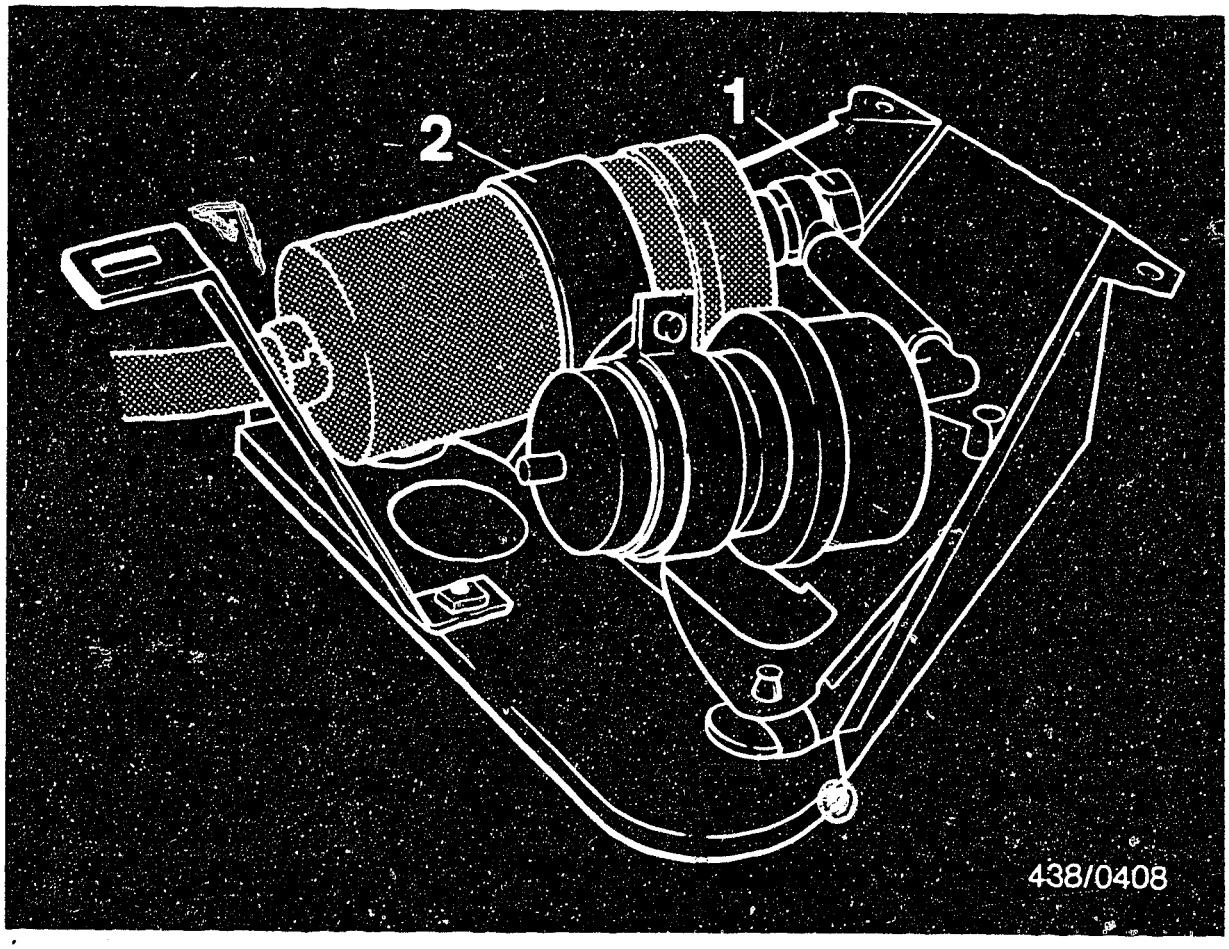
Always screw in a new tube fitting with a new seal ring. Tightening torque 16...20 Nm (1.6...2.0 kgfm).

Caution: Use only the specified seal ring, since it is of special dimensions. Always observe the specified tightening torque and do not exceed, otherwise there is the danger of warping the housing and damaging the thread.



Install in the reverse order, ensuring that the delivery line (6) is in proper condition and that it is securely seated on the delivery fitting (5). If necessary, use a new delivery line (Volvo service part).

Finally, check all connections for leaks with the pump operating.



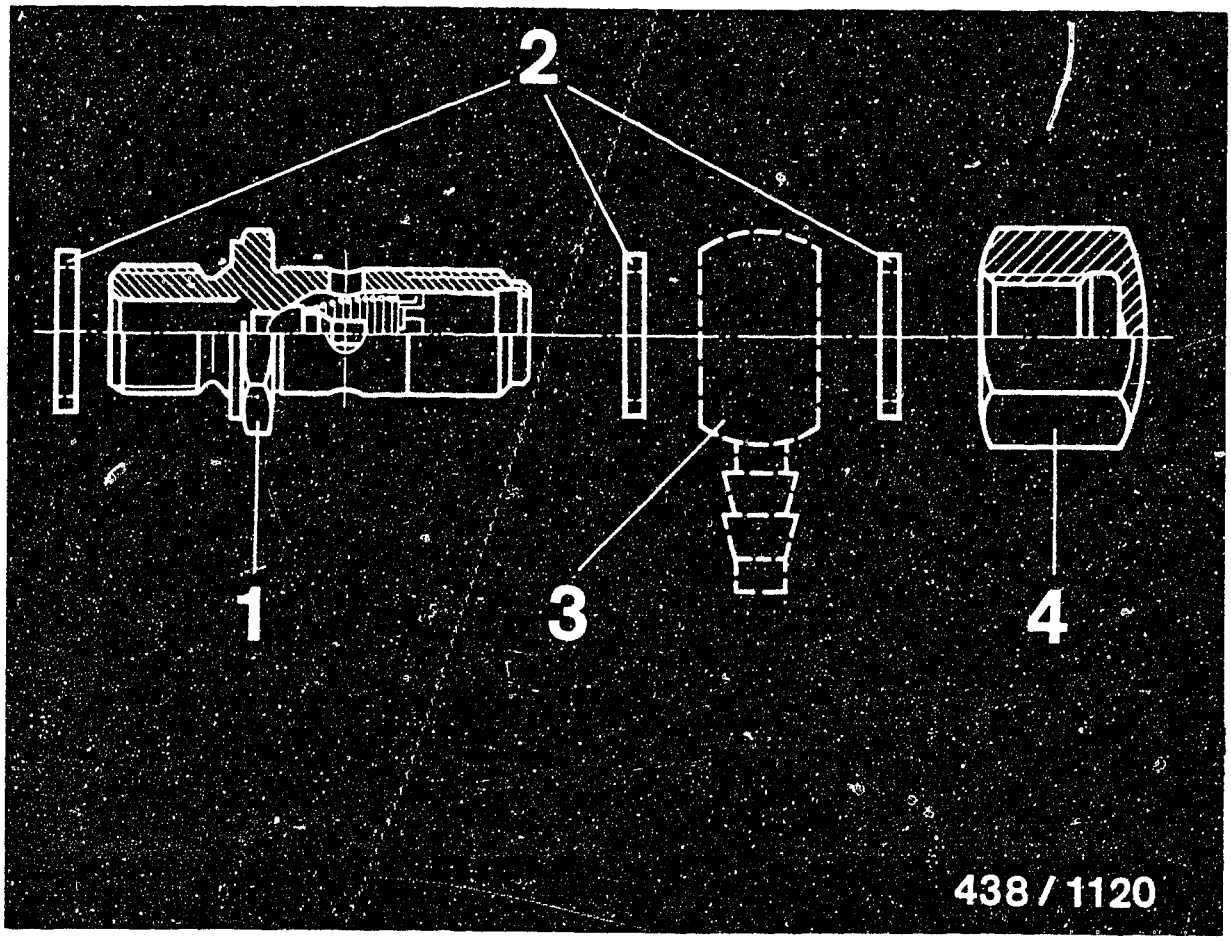
1 = Cap nut 2 = Fastening clamp

Changing the tube fitting with non-return valve in the case of electric fuel pump 0 580 254 972 in the 1980/ 1981 model (pump type EKP IV, intake and delivery fittings in the longitudinal direction of the pump):

Screw off the cap nut (1), applying counter-force at the hexagonal section of the tube fitting.

Loosen the clamping clip (2) and pull the electric fuel pump back slightly.

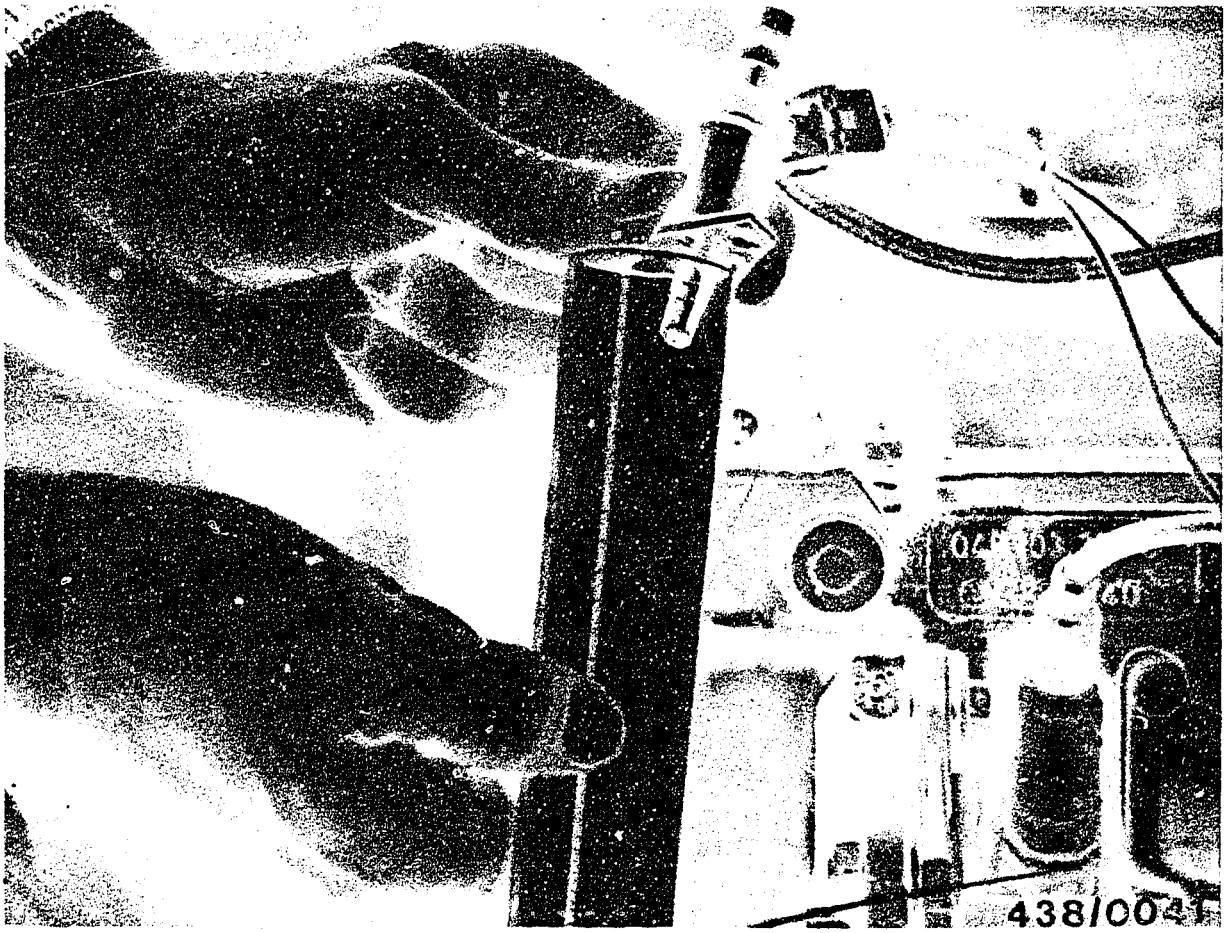
Unscrew the tube fitting, applying counter-force at the fixed hexagonal section on the pump housing with a flat box wrench.



1 = Tube fitting
2 = Seal ring
3 = Inlet union
4 = Cap nut

Screw a new tube fitting (1) with non-return valve into the delivery fitting with a new seal ring (2) and tighten to a torque of 17...25 Nm (1.7...2.5 kgfm).

Place the pump back in its installation position, introducing the tube fitting into the inlet union (3) of the delivery line. Do not forget new seal rings (2) on either side of the inlet union.
Screw on the cap nut (4) and tighten to a torque of 17...25 Nm (1.7...2.5 kgfm).
Re-tighten the clamping clip, re-install the bracket and connect the intake hose.
Finally, check all connections for leaks with the pump operating.



Further possible cause of leaks in the primary-pressure circuit:

- Start valve leaking.

Remove the plug from the start valve and remove the start valve. The fuel line remains connected.

Hold the start valve in a suitable vessel (e.g. a graduate).

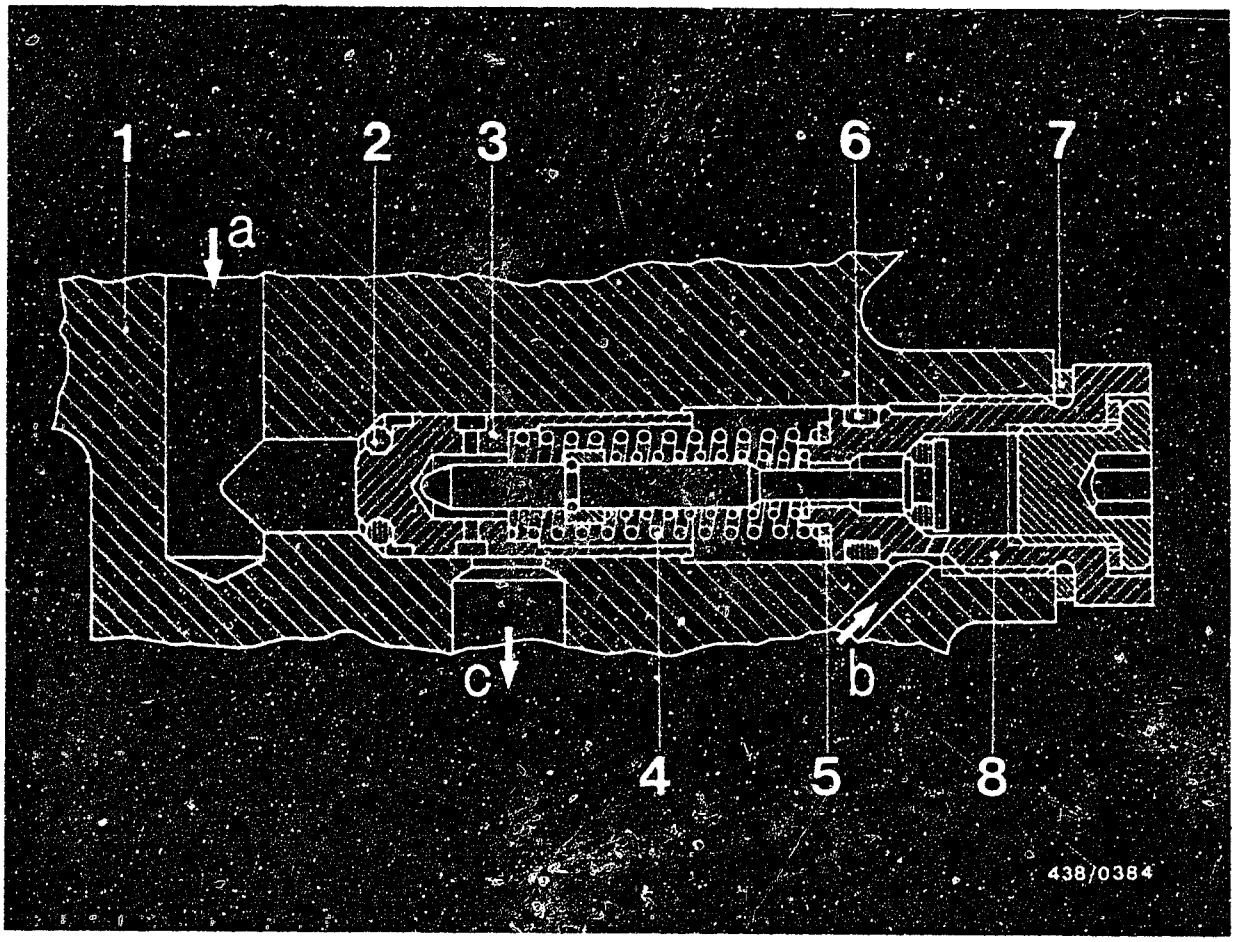
Switch on the electric fuel pump by bridging the electrical safety circuit so that primary pressure is applied to the start valve.

Dry off the nozzle of the cold-start valve.

No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.

Switch the electric fuel pump off again.

Replace the cold-start valve if leaky.
Finally, adjust idle speed with the engine at operating temperature.
Idle-speed adjustment is described on Coordinates G 7.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

Further possible cause of leaks in the primary-pressure circuit:

- Seal ring (O-ring) on control piston of primary-pressure regulator leaking.

  Replace seal ring.
  Clean fuel distributor in region of primary-pressure regulator.

Unscrew the large screw plug (8) with the complete push-up valve. Also remove the shims (5), control spring (4) and control plunger (3).

Replace the seal ring (O-ring) (2) on the control plunger. Install the control plunger and the control spring.

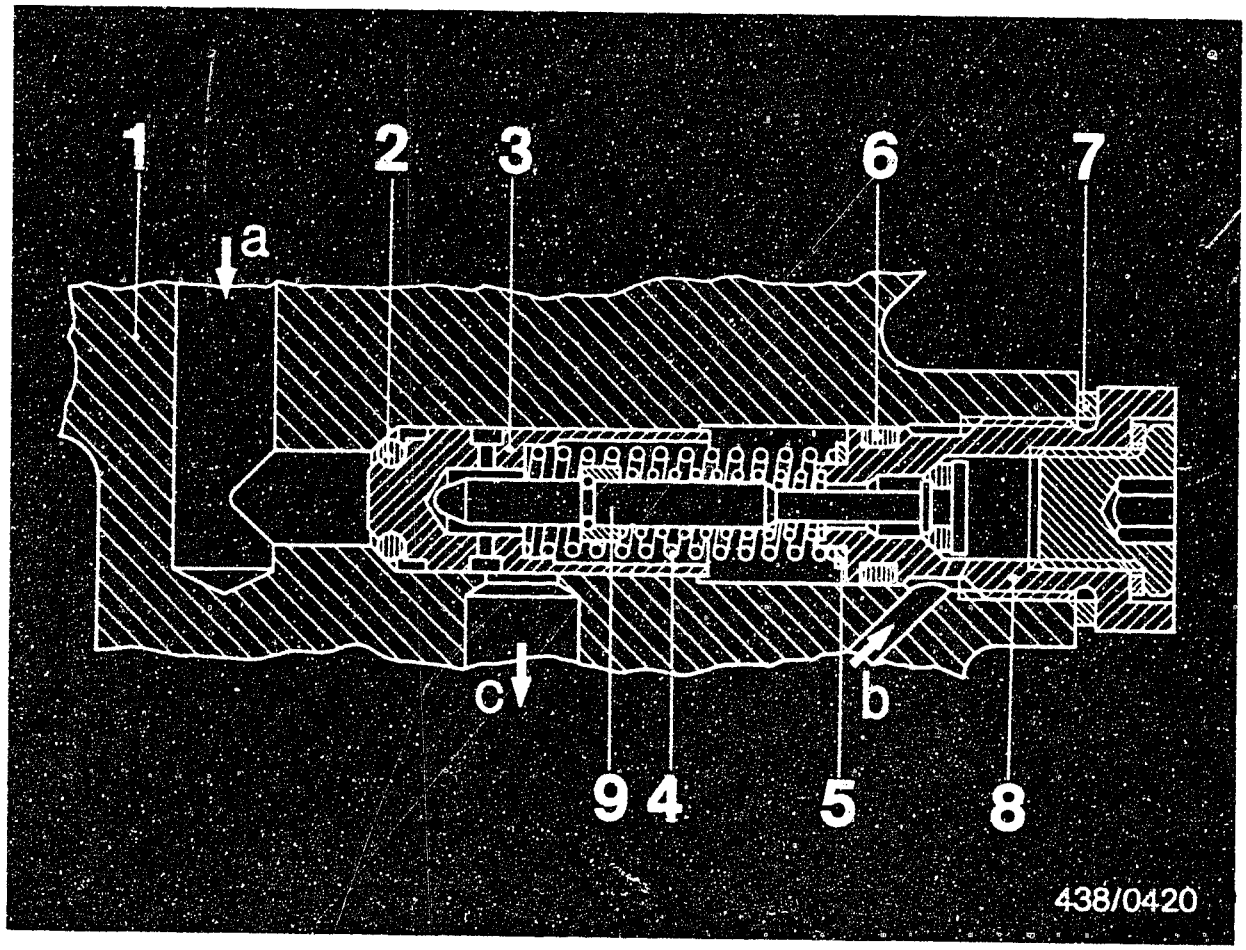
Screw in the screw plug with the complete push-up valve and with shims (as found when removing) and new seal rings (6 and 7).

Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Primary pressure:

Fuel distributor 0 438 100 035

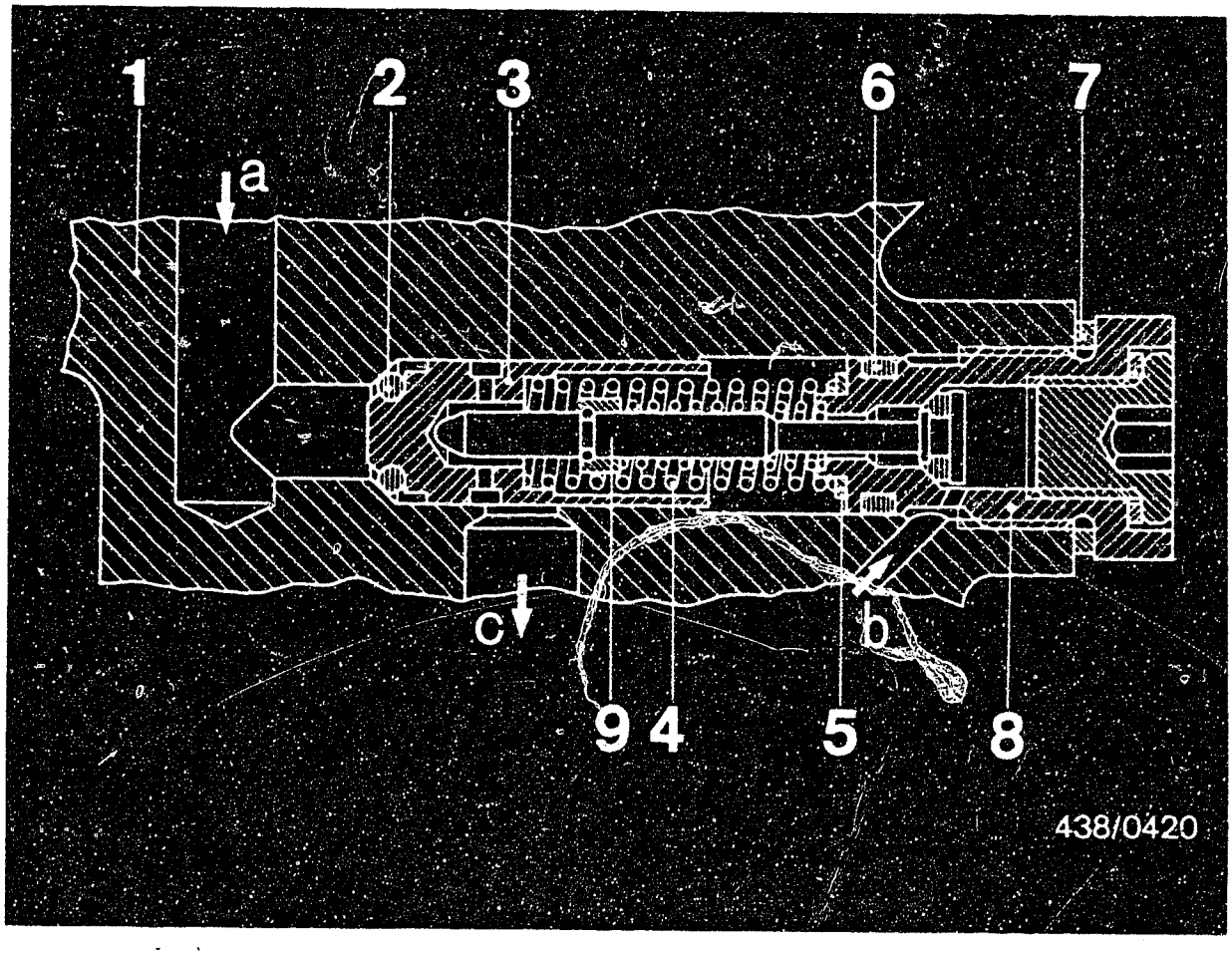
Checking value 4.5...5.2 bar (4.6...5.3 kgf/cm²) gauge pressure
Setting value 4.7...4.9 bar (4.8...5.0 kgf/cm²) gauge pressure



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

16.5 Possible causes of a defect in the control circuit

The push valve (9) in the primary-pressure regulator has a leak.
Since the seal ring of the push valve is rigidly vulcanized onto the valve needle, the whole push valve (ready-assembled unit) must be changed.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

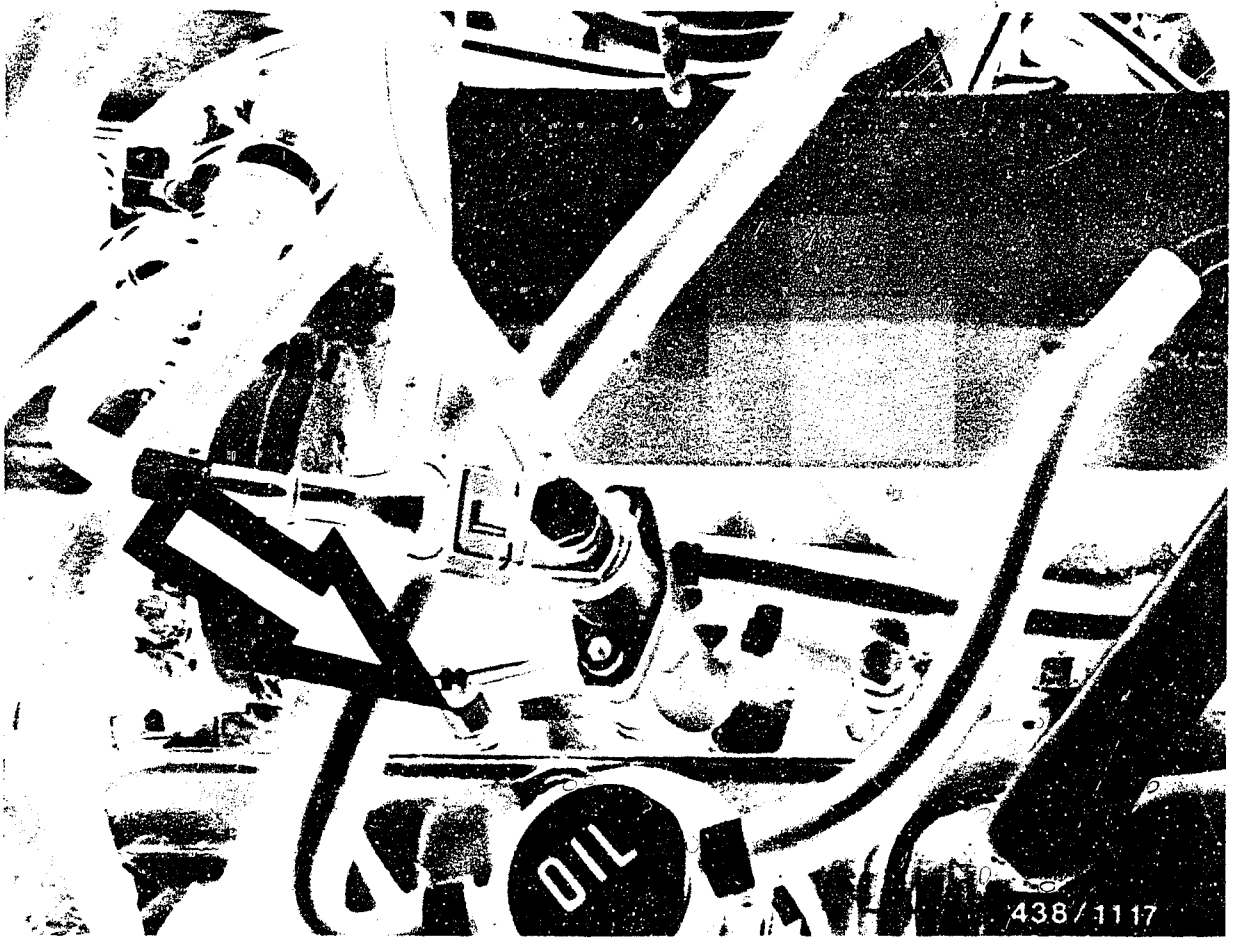
Clean the fuel distributor in the region of the primary-pressure regulator. Screw out the large screw plug (8) together with the complete push valve. Pay attention to control spring (4) and shims (5). Screw in new push valve using the number of shims (5) as when removed, new O-ring (6) and flat seal ring (7). Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Primary pressure - checking and setting values
(gauge pressure)

Fuel distributor part no.: 0 438 100 035

Checking value: 4.5 ... 5.2 bar (4.6...5.3 kgf/cm²)

Setting value: 4.7 ... 4.9 bar (4.8...5.0 kgf/cm²)



17. Testing the injection valves

Remove the injection valves for testing.
They are plugged into corresponding mounting holes in the cylinder heads, underneath the intake ports, and are held in position by spring clamps.
The picture shows the injection valve of cylinder 5 (arrow).

To loosen the inlet-union screws, apply counter-force to the fixed hexagonal section of the injection valves.

17.1 Test equipment and test media

The following testing specification refers to valve testers KDJE-P 400 (previously KDEP 7452) and 0 681 200 700.

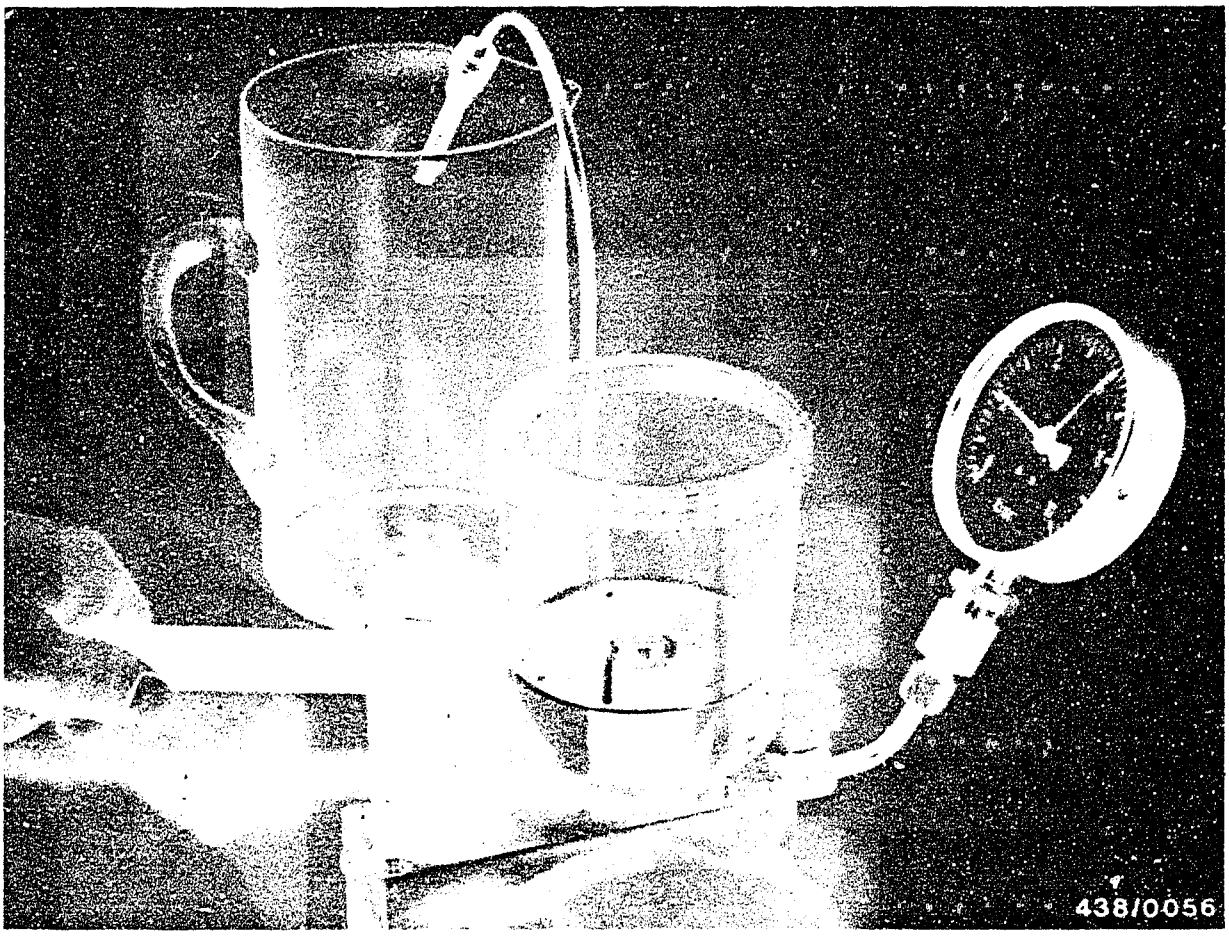
Observe the test-media specification!

Test media:

Bosch, Part No. VS 14 942-CH
Former Part No. 5 973 340 650
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:

Firma
Oskar Gnamm GmbH
D-7531 Kämfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

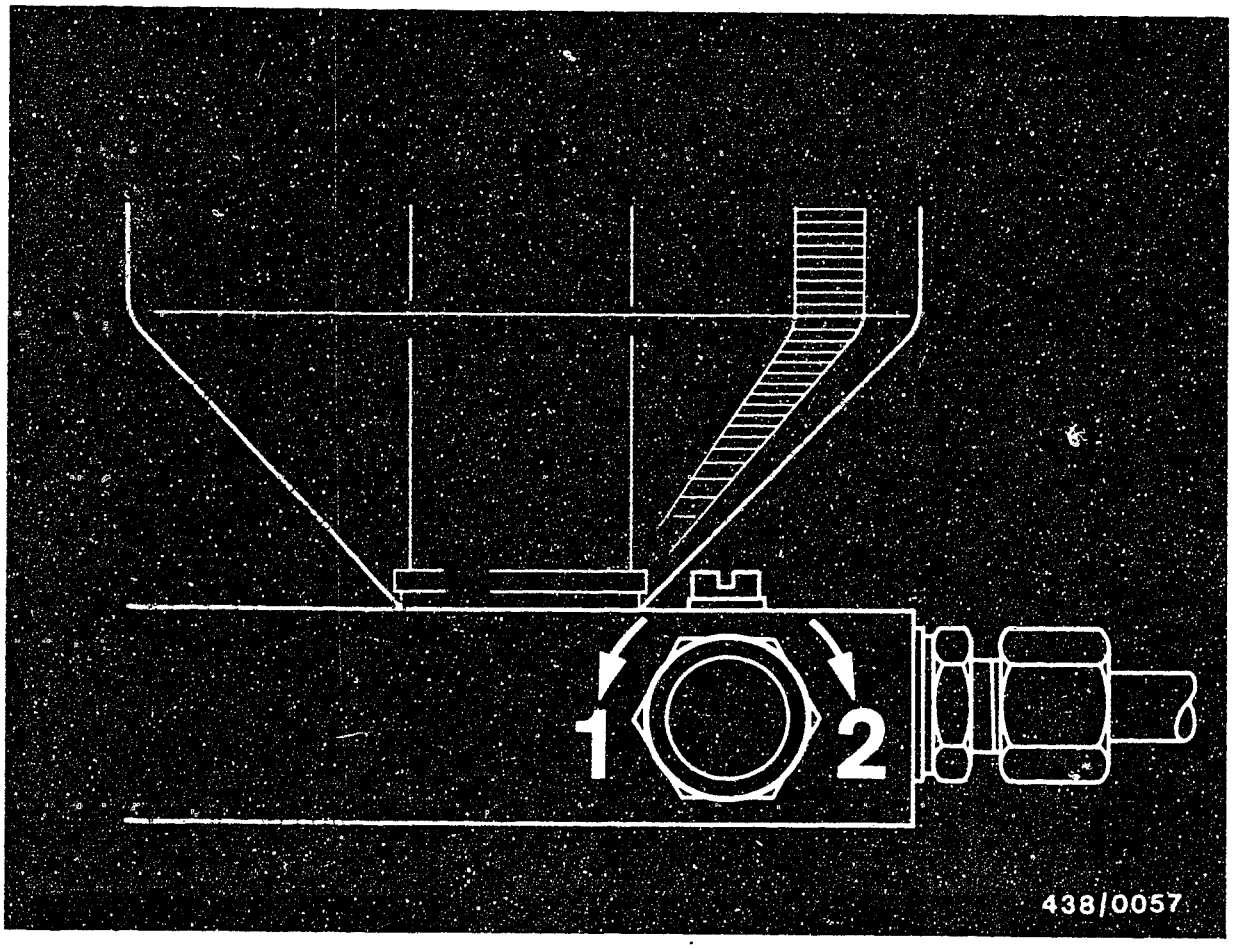


17.2 Connecting the injection valve to the tester

Connect the injection valve to the valve tester using double threaded fitting 2 433 356 045 (accessory to valve tester) and, first of all, with the union nut loosened, bleed by operating the lever several times. Then tighten the union nut.

17.3 Checking for dirt

Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).
You can try to flush the injection valve clear by moving the lever back and forth several times strongly.
If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.



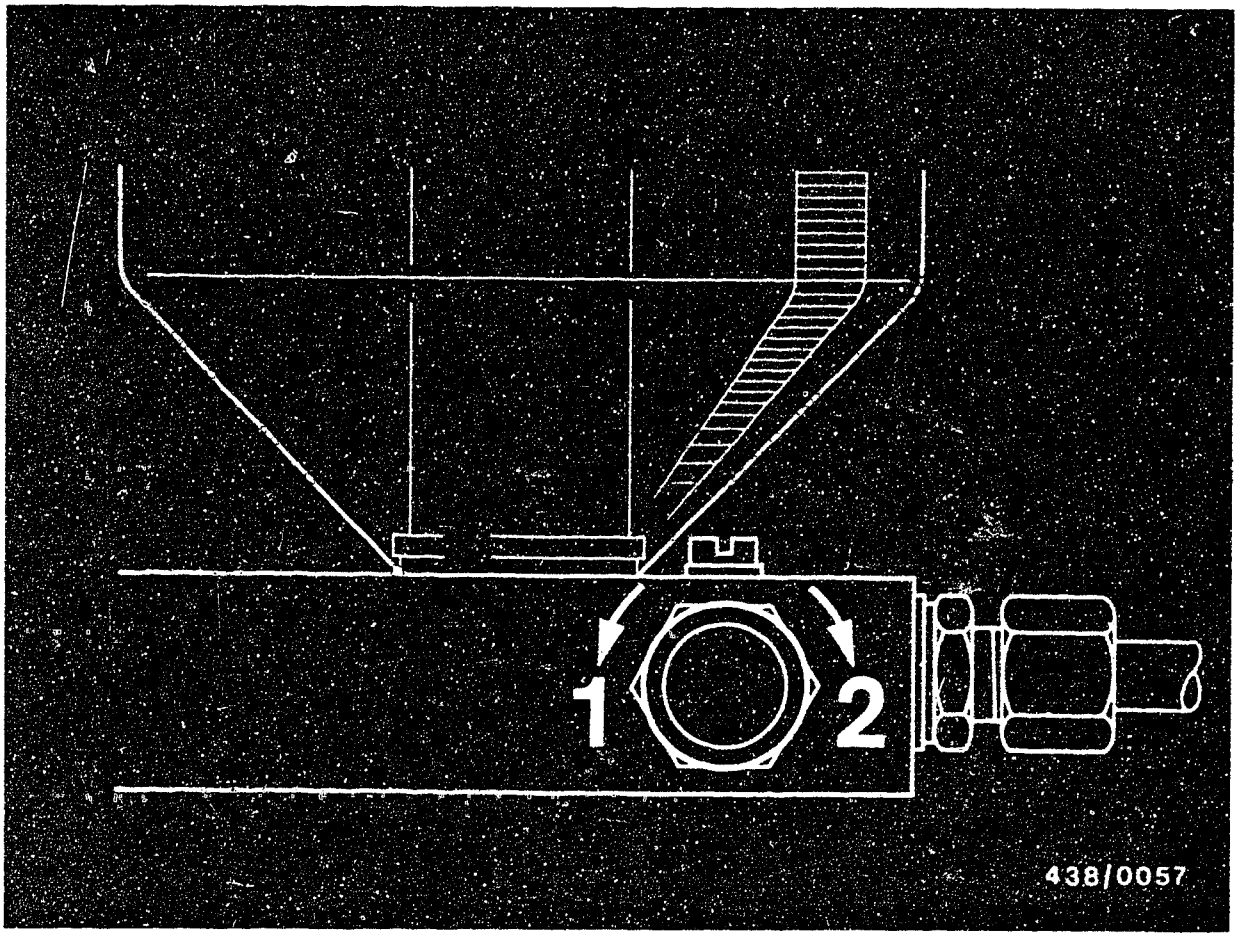
1 = Open 2 = Closed

17.4 Testing the opening pressure

Injection valve part number: 0 437 502 013

Opening pressure: 2.7...3.8 bar (2.8...3.9 kgf/cm²)

Pressures are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

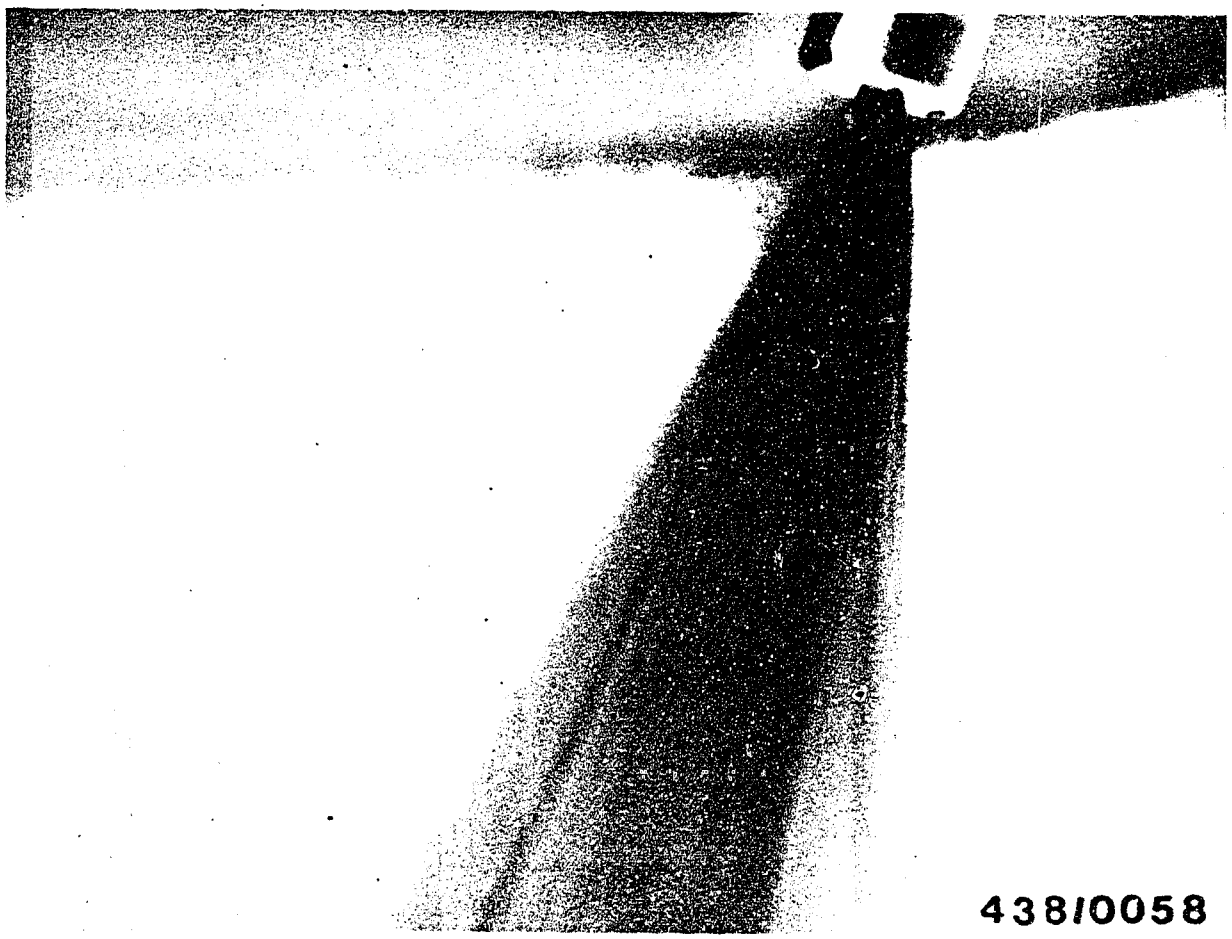


With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).

If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.3 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.



438/0058

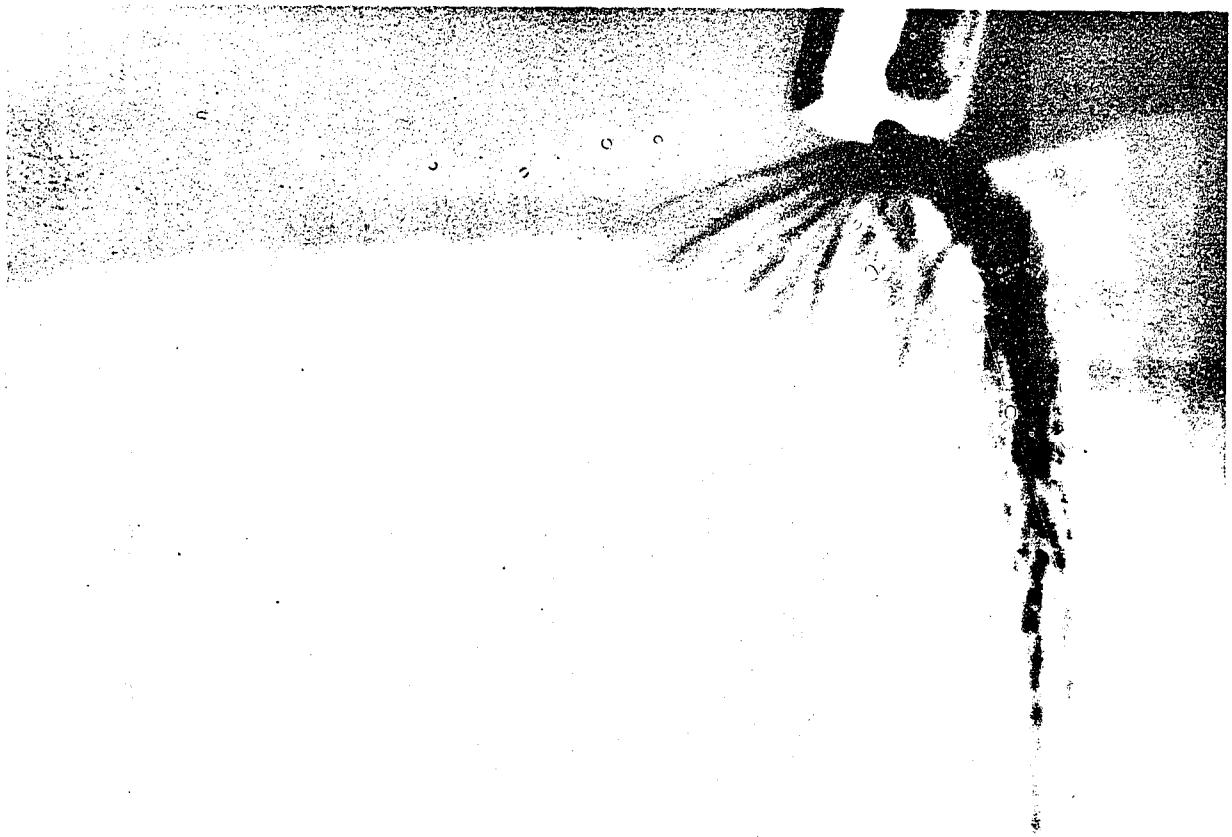
17.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.

438/0059

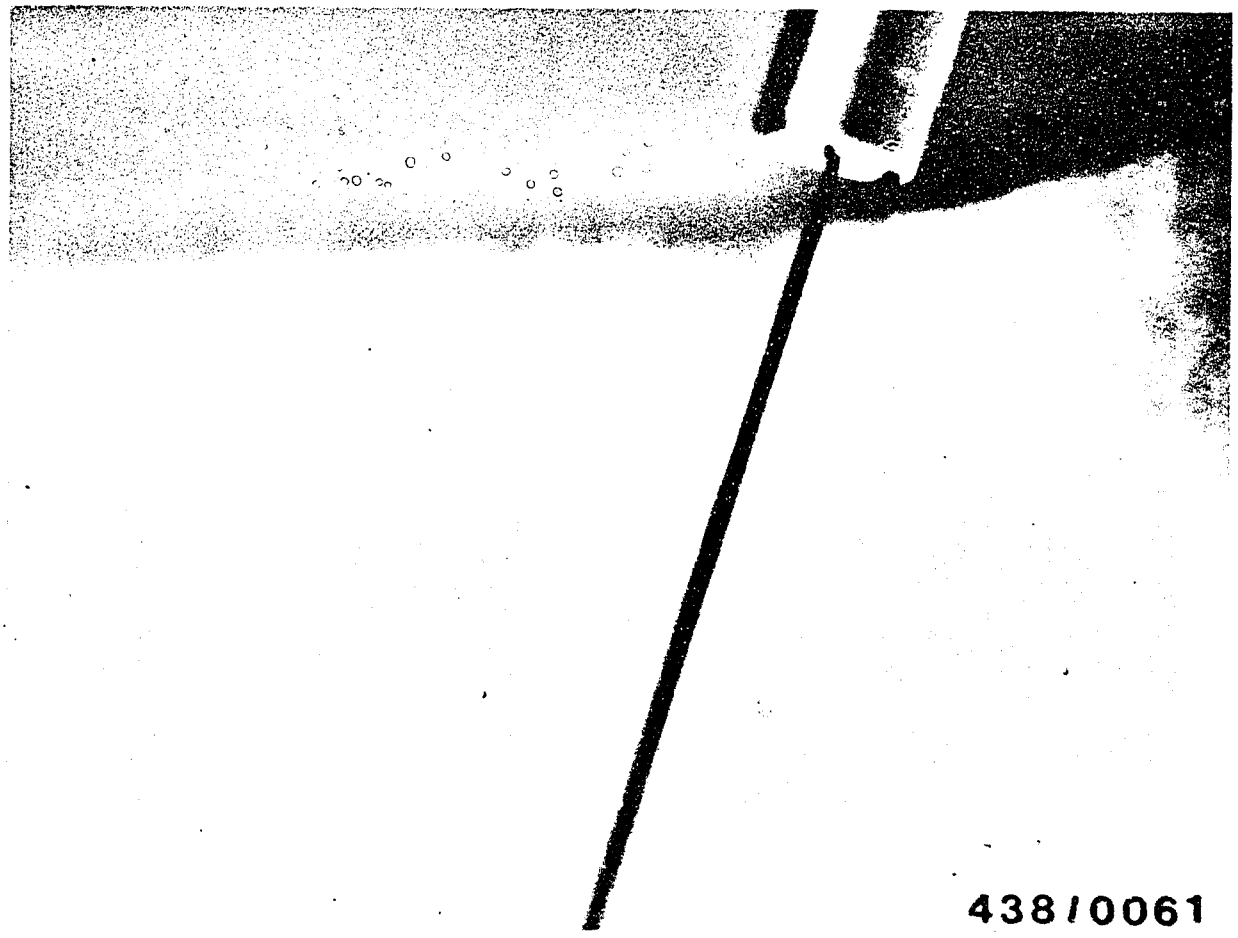
Illustration shows single-sided but nevertheless good spray formation.



438/0060

Poor spray formation; replace injection valves.

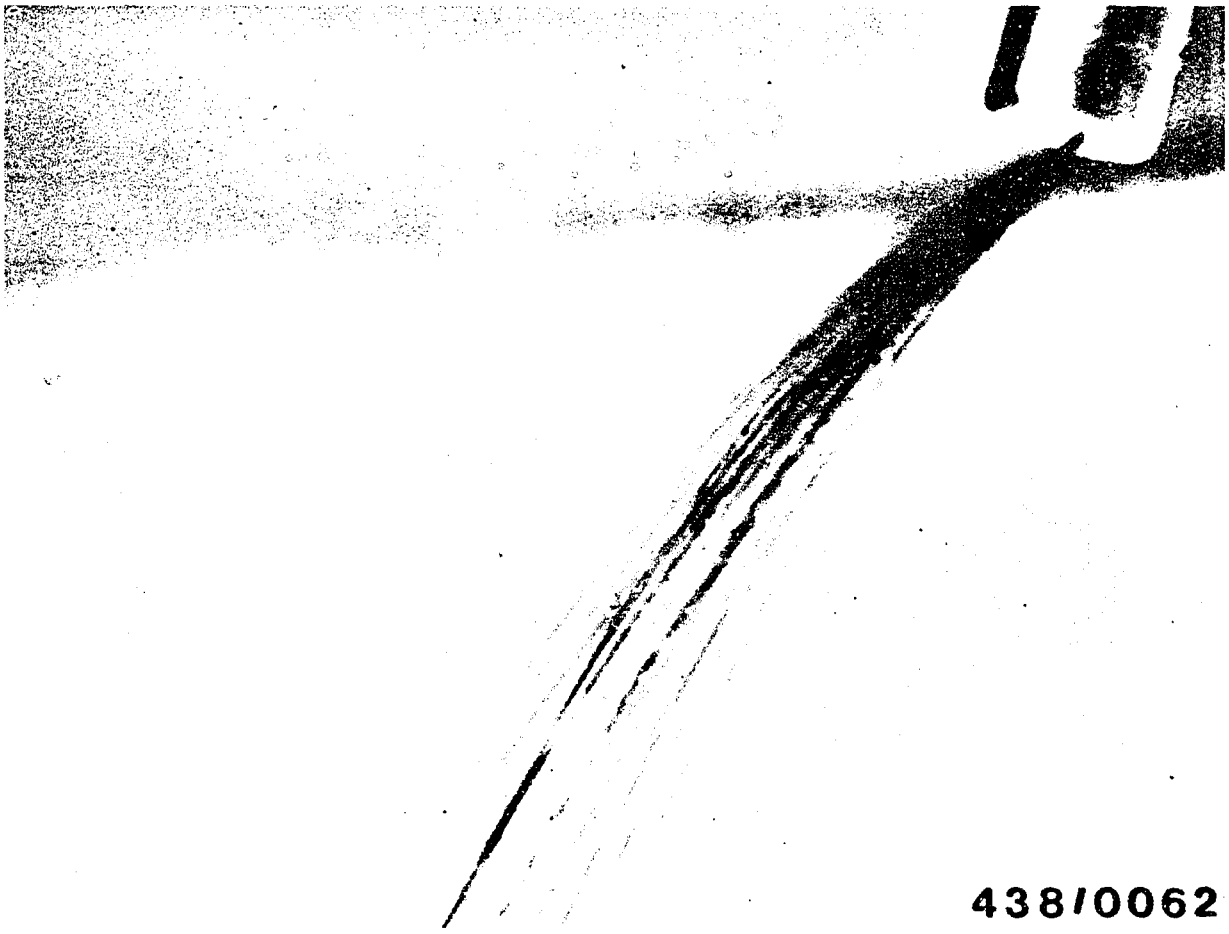
Illustration shows drop formation.



438/0061

Poor spray formation; replace injection valves.

Illustration shows "cord" spray.



438/0062

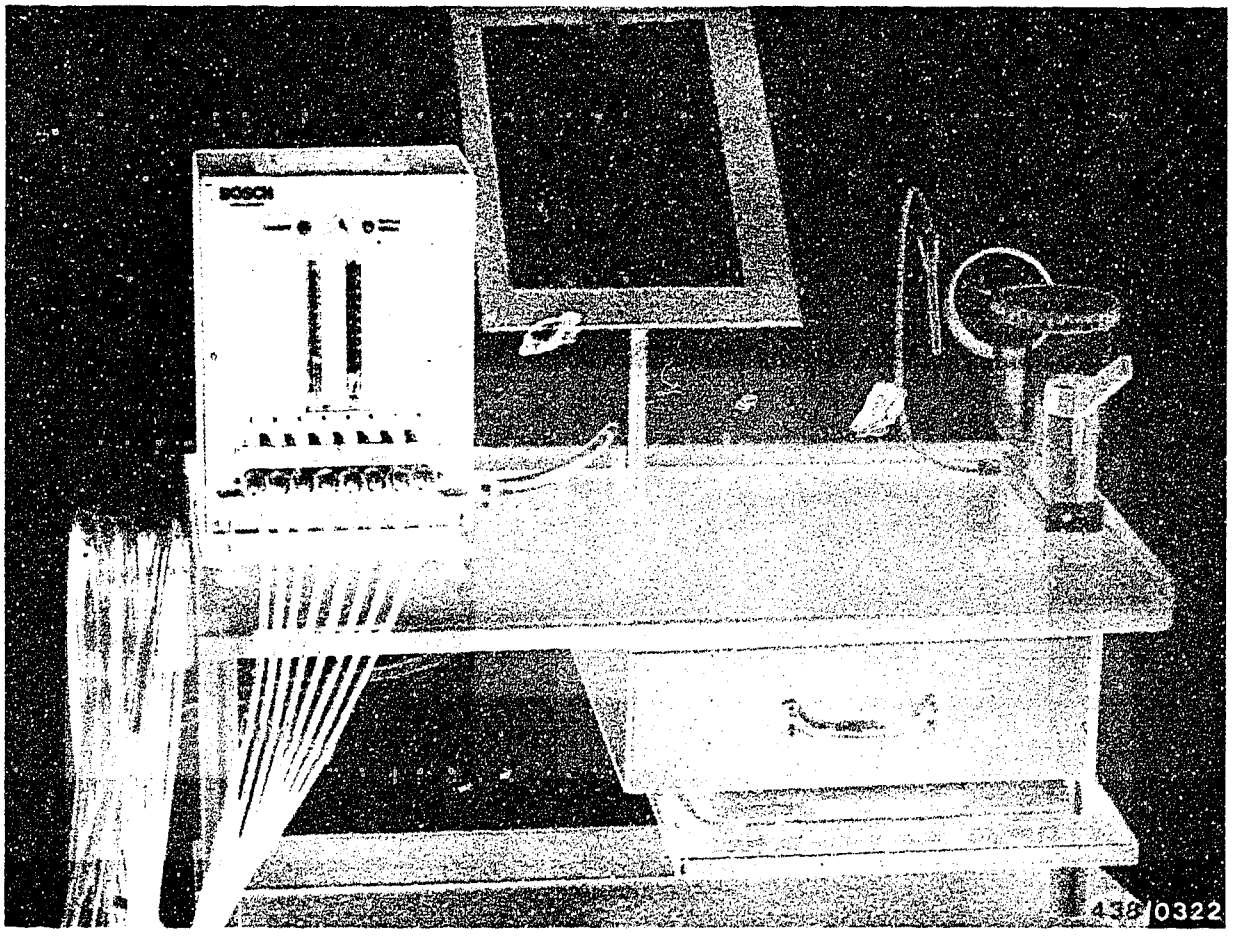
Poor spray formation, replace injection valves.

Illustration shows "spray in strands".

Defective injection valves must be discarded.
It is also possible to replace individual injection valves within one set (for one engine).

Before installing the valves, check the condition of the rubber cup seals.
Defective, cracked or swollen cup seals must be replaced (Volvo service part).

When installing, make sure that the injection valves are properly seated.
The spring clamps must latch into position.
Connect the injection lines with new seal rings.

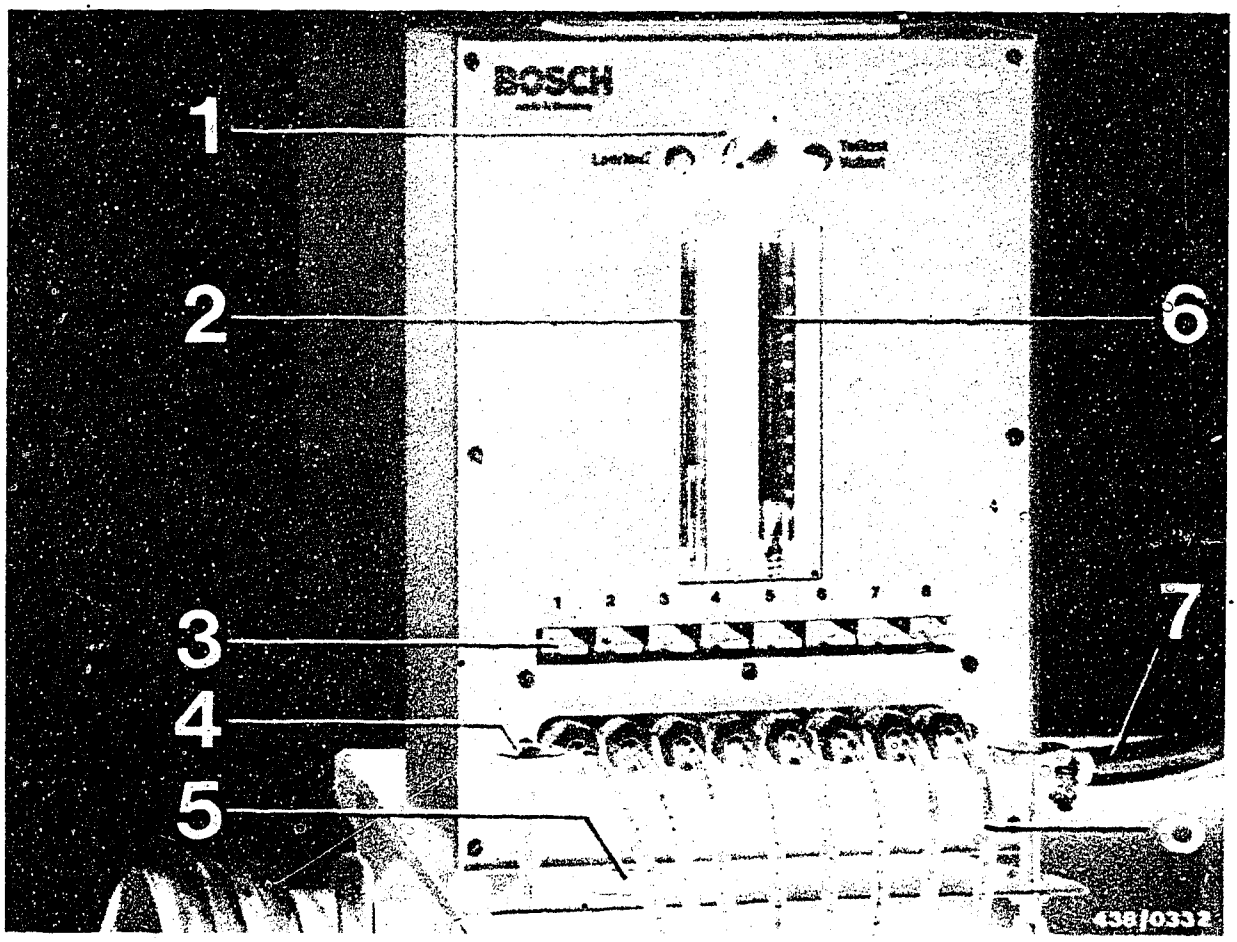


18. Comparative measurement of fuel delivery of fuel distributor outlets.

This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

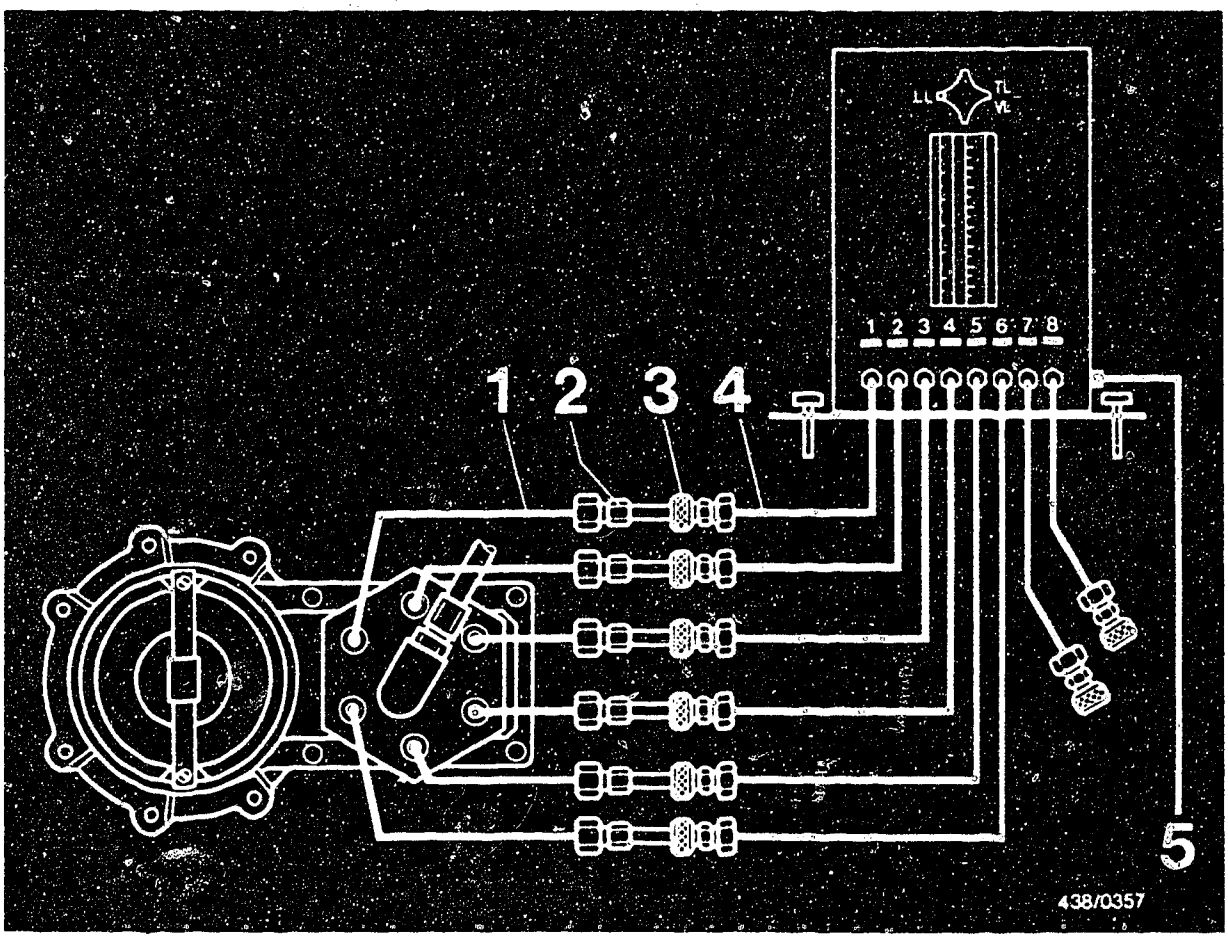
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



1 = Fuel distributor injection tubing
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

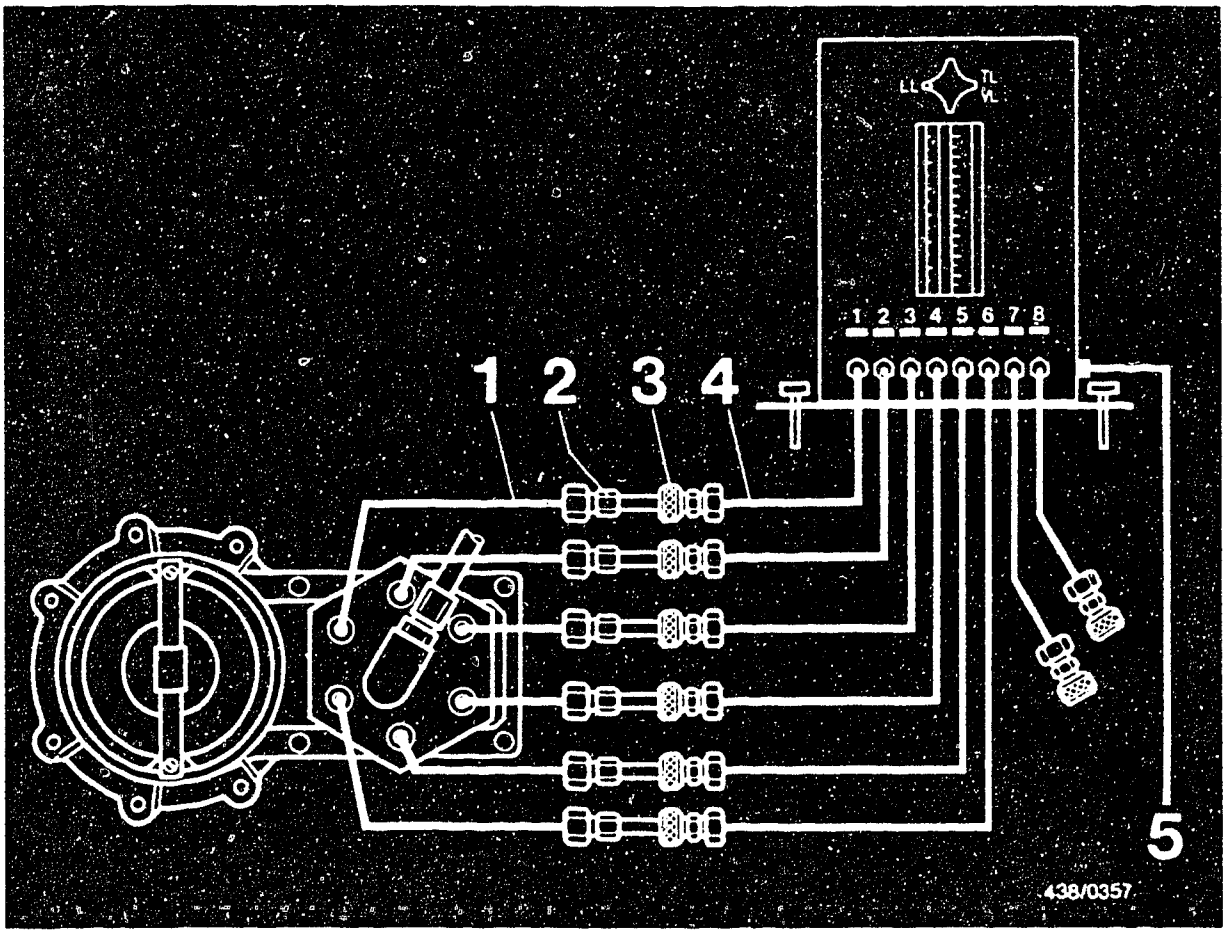
18.3 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

Remove the injection valves.
The injection lines remain connected.

The valves are plugged into corresponding mounting holes in the cylinder heads, underneath the intake ports, and are held in position by spring clamps.

The picture shows the injection valve of cylinder 5 (arrow).



1 = Injection lines
2 = Injection valves
3 = Automatic connectors
4 = Tester lines
5 = Return line to fuel tank filler neck

Clean the injection valves with a rag and insert in appropriate sequence into the automatic connectors of the first six tester lines.

Note:
Plug in the injection valves firmly as far as they will go and tighten the knurled nuts properly so that the non-return valves of the automatic connectors are opened fully.
Introduce the return hose of the tester into the fuel tank filler neck.

18.4 Bleeding the tester for delivered quantity comparison

Remove the air-intake dome (to the air filter) so that the air-flow sensor plate becomes accessible.

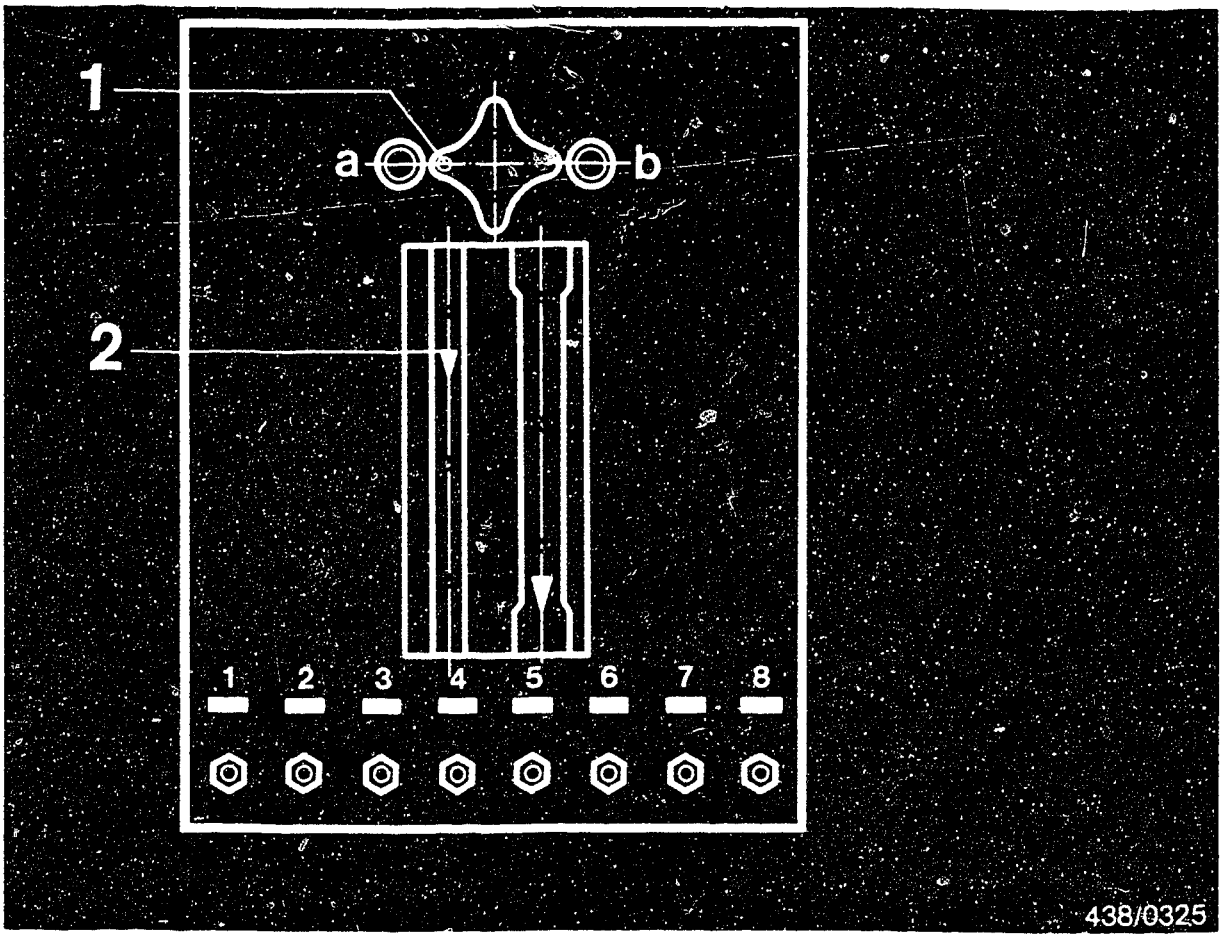
Remove the electric connectors from warm-up regulator and auxiliary-air device.

Switch on the electric fuel pump by bridging the electrical safety circuit.

Deflect the air-flow sensor plate downward as far as it will go.

Press the buttons of the 8-way valve one after the other, switching the 3-way change-over cock several times until both measuring tubes are free of air.

Bring the air-flow sensor plate back into the rest position.

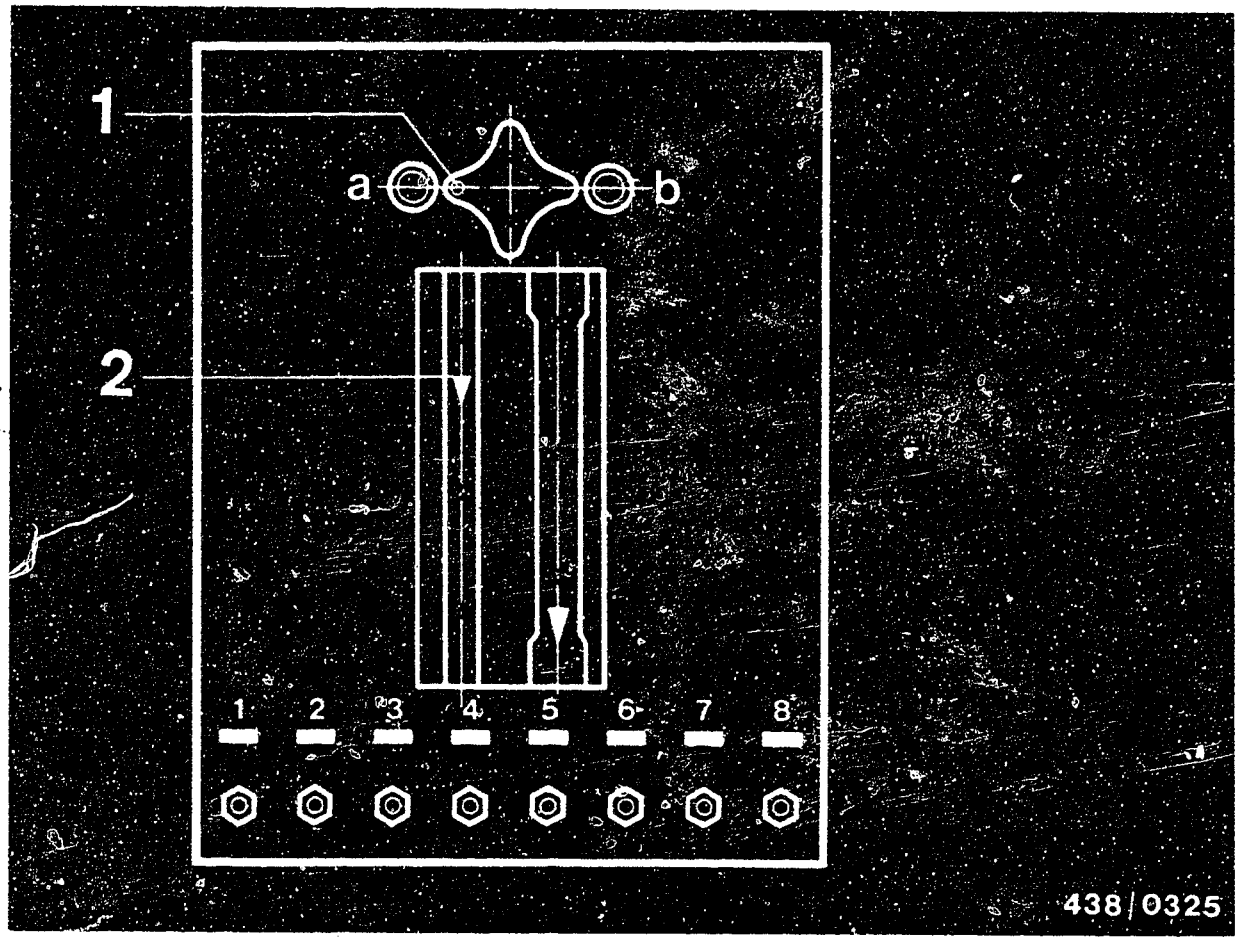


1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

18.5 Testing

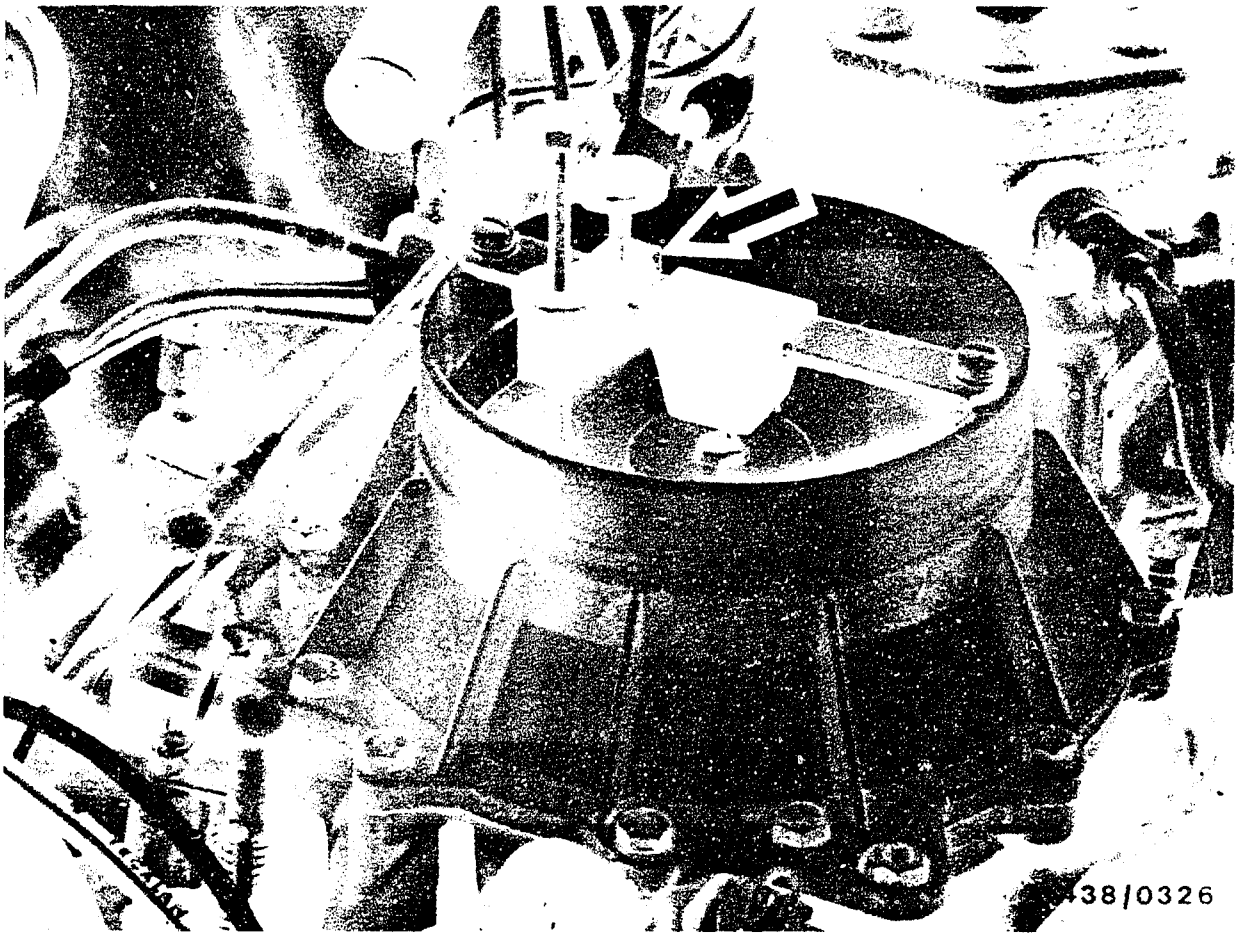
The flow comparison measurement is made in the idle, part-load and full-load ranges.
The small rotameter tube is to be used for the idle measurement (white dot to the left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to the right).



1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2). On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20 ... 30 seconds in the case of small deliveries.



The precise setting and locating of the air-flow sensor plate for the various load ranges is done using the setting device KDJE 7456.

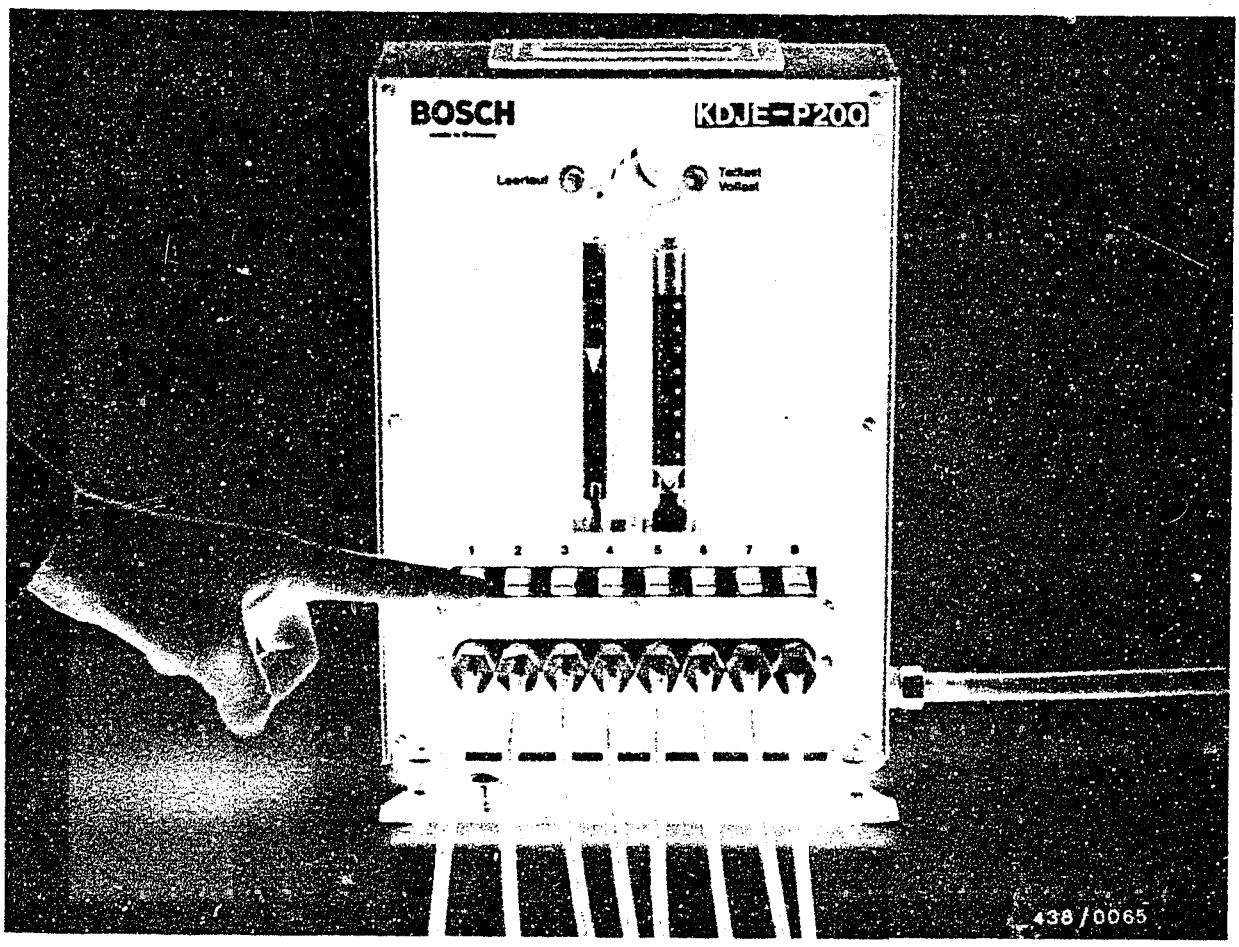
With the adjusting screw initially screwed out all the way, the setting device is clamped onto the stop bracket of the air funnel (arrow).
Adjust the position of the air-flow sensor plate using the adjusting screw.

Testing procedure

Switch on the electric fuel pump by bridging the safety circuit.

The following section gives fixed numerical values for the individual load ranges as the maximum allowable differences in fuel delivery.

The "setting point" value always refers to the fuel-distributor outlet with the lowest delivery, i.e. first of all determine which outlet has the lowest delivery.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

18.6 Test specifications

	Setpoint (cm^3/min)	Max. permissible fuel delivery (cm^3/min)
Idle	6.0	6.8
Part load	40.0	44.0
Full load	145.0	160.0

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.

Before installing the injection valves, check the condition of the rubber cup seals.
Defective, cracked or swollen cup seals must be replaced (Volvo service part).

When installing, make sure that the injection valves are properly seated.
The spring clamps must latch into position.

Re-install the air-intake dome (to the air filter) and finally check the idle adjustment, correcting if necessary.

Idle adjustment is described on Coordinates G 7.

19. Idle adjustment

19.1 Test conditions

Warm the engine up for the idle adjustment (oil temperature approx. 80°C).

Important:

If the fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.

The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.

In vehicles with an air conditioner, this should be switched off to stabilize the engine speed during idle-speed adjustment.

Engine-speed measurement with separate tachometer.

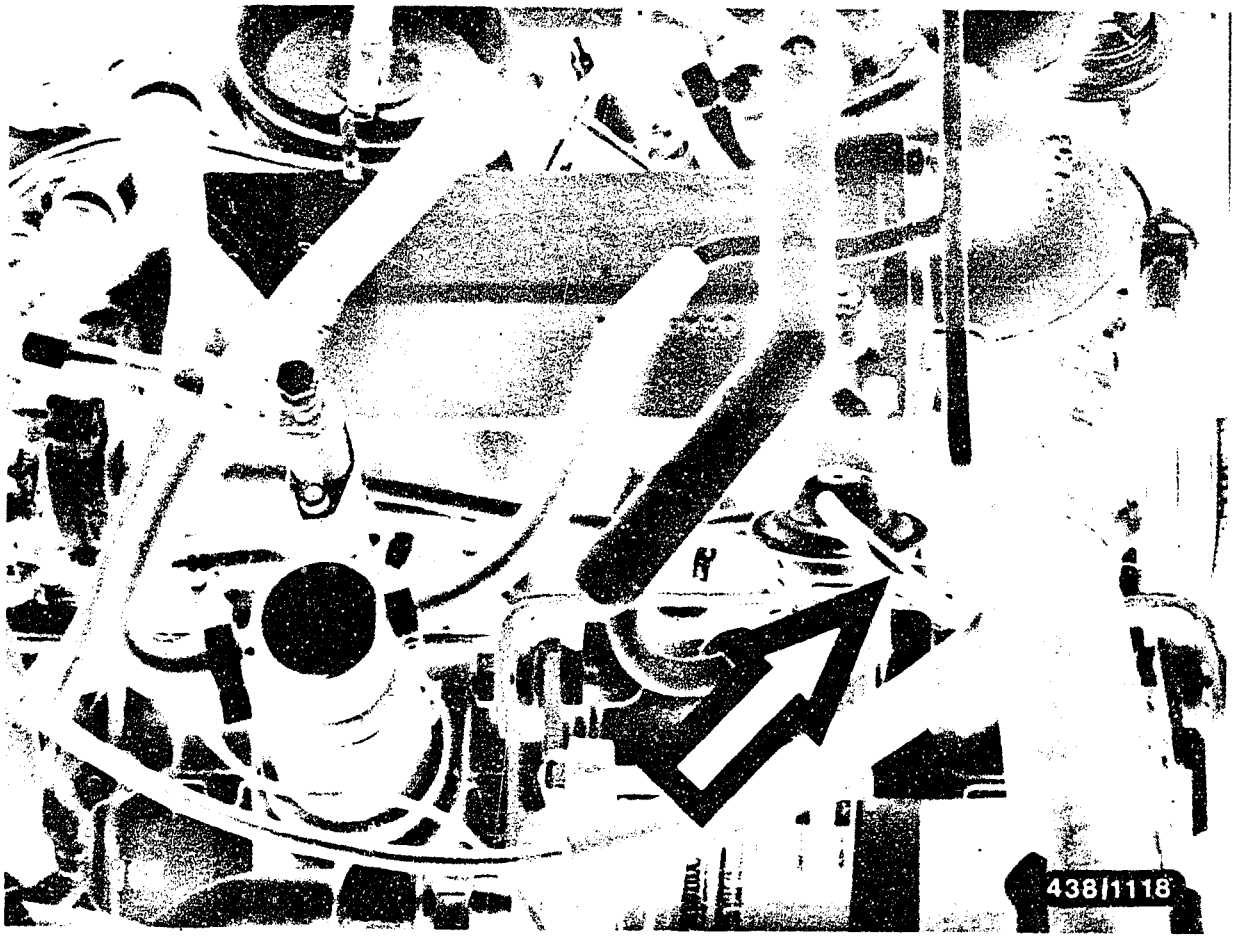
Exhaust gas is sampled at the exhaust tail pipe.

Idle test and adjustment with air filter connected.

Additional test conditions for Sweden and Australia models:

For checking and setting the idle adjustment, the "Pulsair" system and the exhaust-gas recirculation system must be rendered inoperative.

To render the "Pulsair" system inoperative, remove the hose line for fresh-air intake on the air-intake dome (arrow) and seal off tight.



To render the exhaust-gas recirculation system inoperative, remove the vacuum-control line from the EGR valve (arrow) and seal off tight.

19.2 Test specifications for idle adjustment

Note: Engine oil temperature approx. 80°C.

Idle speed

All versions with automatic transmission:	1000 min^{-1}
manually-shifted transmission:	900 min^{-1}

CO concentration (% by vol.):*

Checking value

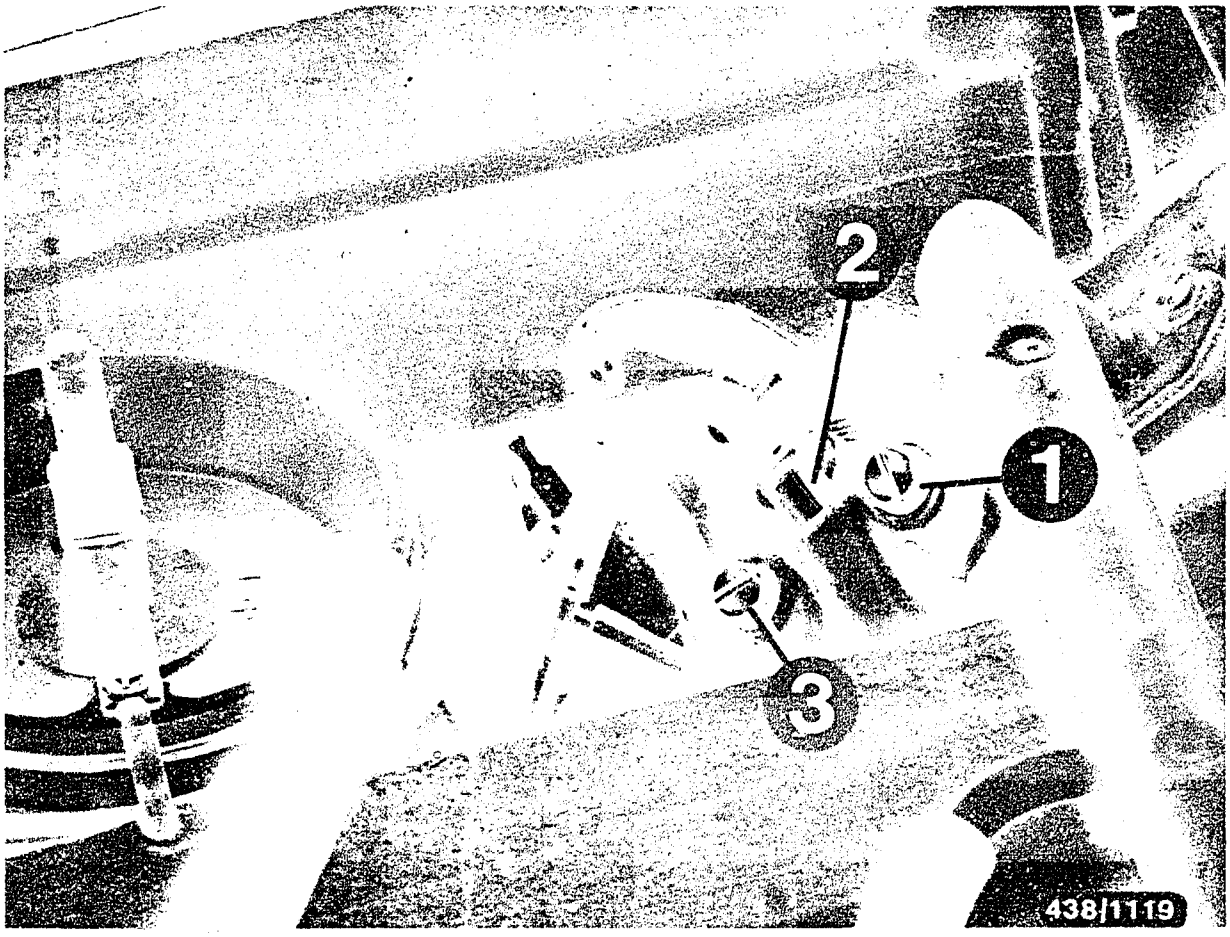
All versions:	1.0 ... 3.0 % by vol. CO

Setting value

All versions:	2.0 % by vol. CO

* Engines whose CO concentration is within the checking tolerance need not be re-adjusted if otherwise running smoothly.

  If the CO concentration is outside the checking tolerance, set to the setting value.



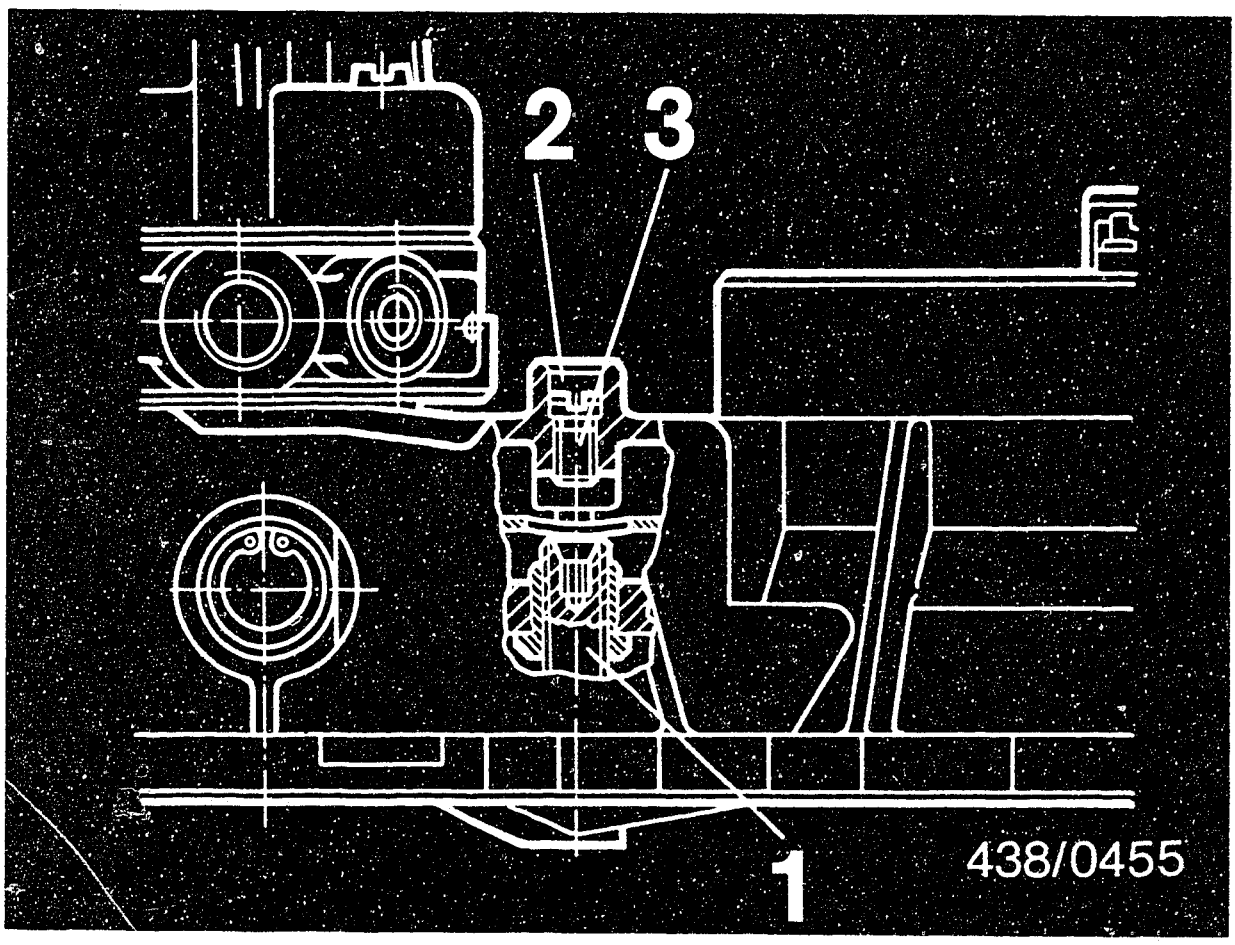
19.3 Adjusting the idle speed

There are three adjusting screws in the throttle-valve housing:

Screw 1 for the right-hand cylinder bank
Screw 2 for the left-hand cylinder bank
Screw 3 for the overall adjustment

Note:
The right-hand intake manifold leads to the left-hand cylinder bank and vice versa.

Therefore, screw 3 is the adjusting screw for the idle speed of the engine. Screws 1 and 2 were set at the factory and must not be changed.



1 = Idle-mixture-adjusting screw
3 = Screw plug
2 = Anti-tamper plug

Adjusting the CO concentration

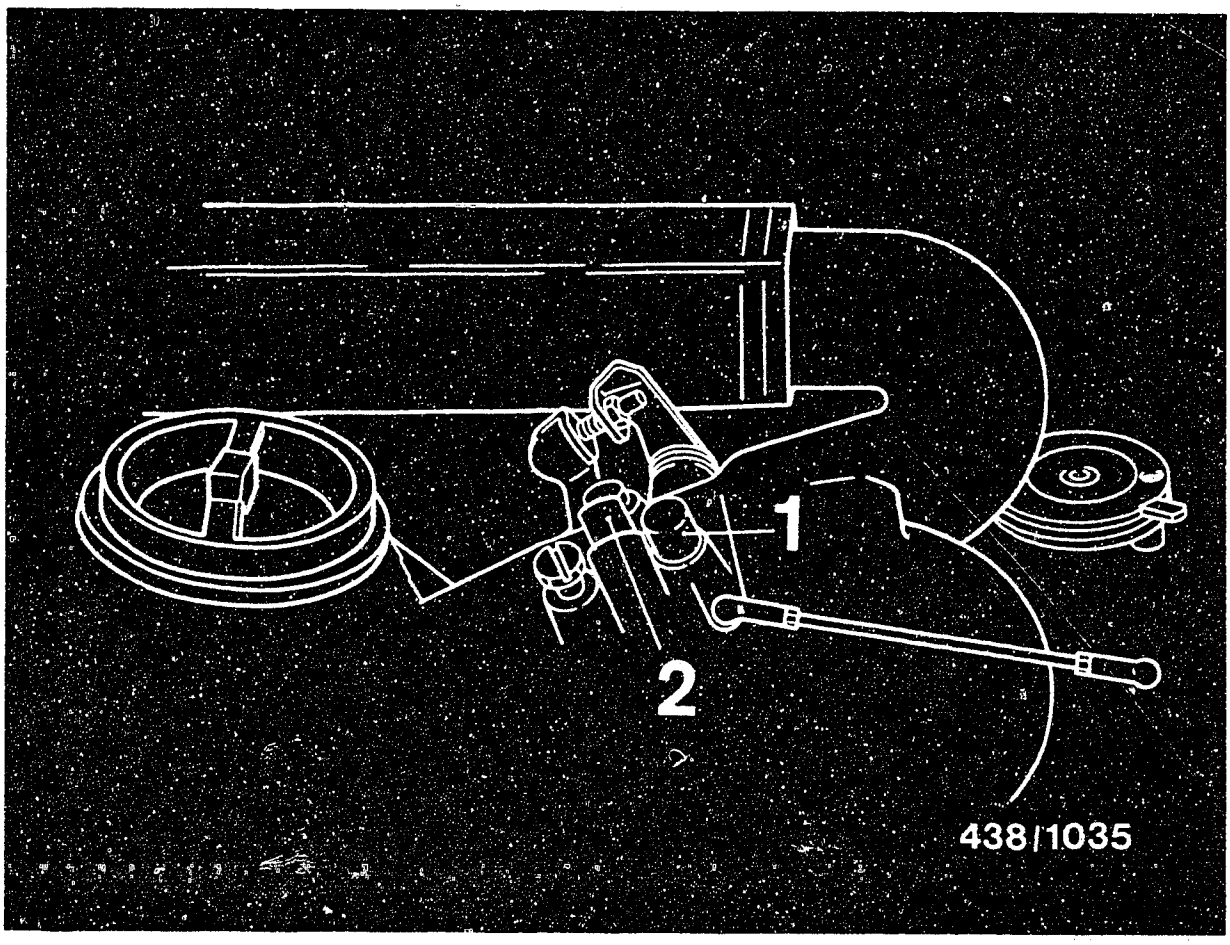
The CO concentration is adjusted by turning the idle-mixture-adjusting screw (1) in the mixture-control unit using the adjusting wrench KDEP 1035.
The idle-mixture-adjusting screw is made accessible by removing the anti-tamper plug (2) and the screw plug (3) in the air-flow sensor housing.
The anti-tamper device is removed and fitted using special tools (e.g. tool set No. 4521/7 from Hazet, 5630 Remscheid).
The adjusting wrench KDEP 1035 is inserted through the housing bore and is inserted into the idle-mixture-adjusting screw.

Turning in a clockwise direction = enriches the mixture
Turning in a counterclockwise direction = leans the mixture

Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

Remove the adjusting wrench after each adjustment and seal off the inlet bore to the idle-mixture-adjusting screw.
With the bore opened, unmetered air would be drawn in with the downdraft air-flow sensor, thus making the measurement result incorrect.

Accelerate the engine briefly after each adjustment so that the intake passages cool down; then wait until the reading on the CO analyzer has settled.

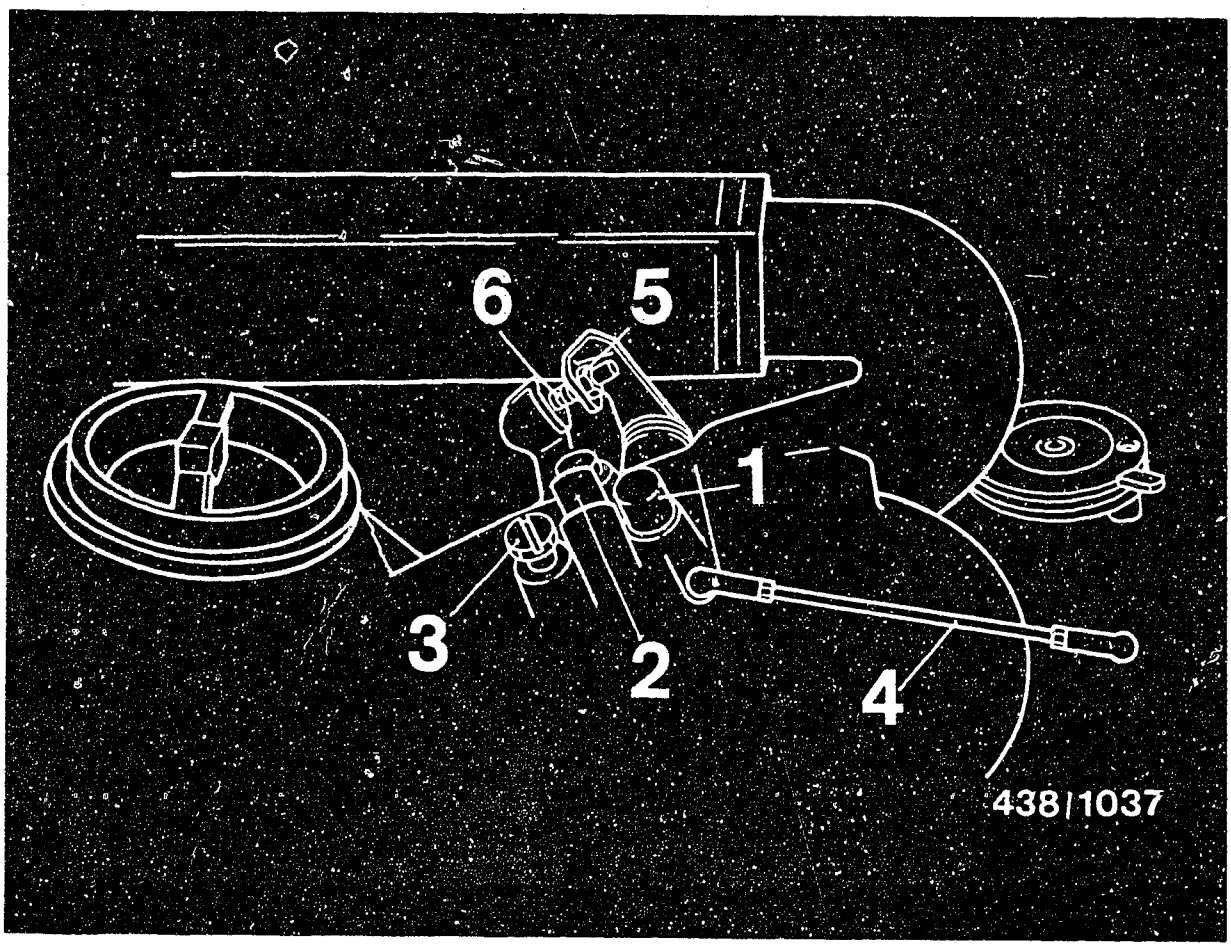


19.5 Additional adjustment information

If, while observing the specified idle values, it is not possible to obtain correct running of the engine, it is necessary to perform the basic setting of screws (1) and (2) as well as of the throttle-control device.

Basic adjustment of screws (1) and (2):

After removing the anti-tamper caps, screw in both screws as far as they will go; then screw out by 3.5 ... 4 turns.
The same value for both screws is important.



3 = Screw for overall adjustment
4 = Pressure rod
5 = Lock nut
6 = Throttle-valve stop screw

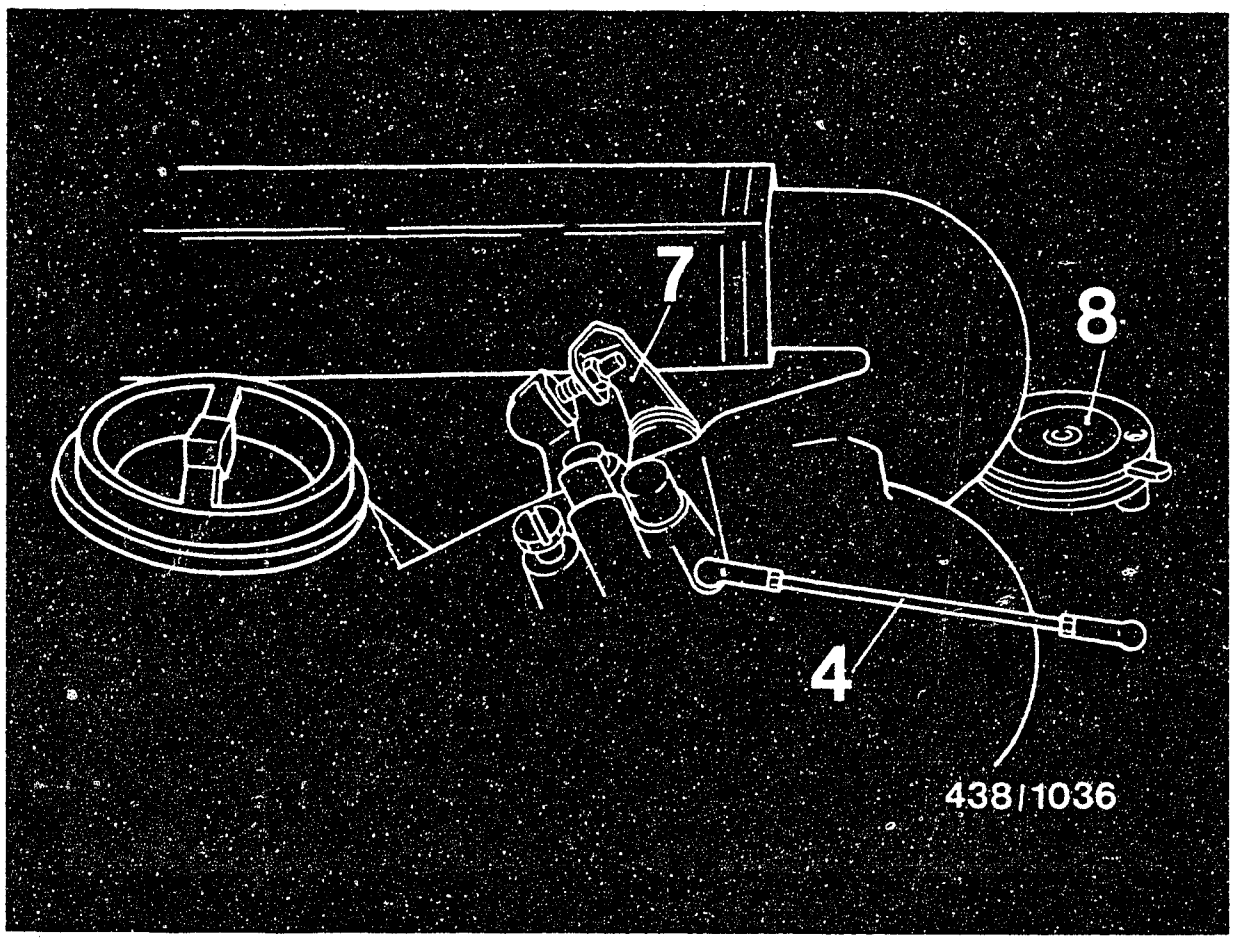
Throttle-control device:

Unhook the pressure rod (4) from cable drum to throttle-valve lever. Loosen lock nut (5) of throttle-valve stop screw (6).

Run engine at idle and screw in screw (3) as far as it will go.

By turning the throttle-valve stop screw (6), set the engine speed to n = 700 min^{-1} and lock with lock nut.

Set the specified idle speed (n = 900 min^{-1}) using screw (3).



4 = Pressure rod
7 = Throttle-plate lever
8 = Cable drum

Pressure rod:

Set the length of the pressure rod (4) so that, when plugging onto the ball pins, neither the throttle-plate lever (7) nor the cable drum (8) are moved out of their rest position.

Throttle-control cable:

In the idle position, the cable drum must return as far as the drum stop.
The throttle cable must remain extended without the cable drum being moved out of its rest position.
At full throttle the cable drum must be up against the full-throttle stop.

19.5 Anti-tamper device for idle-mixture-adjusting screw:

In the Federal Republic of Germany, § 47 of the FMVSS/CUR, "Exhaust Gases and their Discharge", has been amended. This amendment order was printed in full in the Verkehrsblatt 13 of 15th July 1975.

Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissibly influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.

These anti-tamper caps come in different colors. Use the following cap and cover for after-sales service:

In the downdraft air-flow sensor:
Blue anti-tamper cap (not available from Bosch).
Part number from German Carburettor Company: K 34 520.

The anti-tamper device is removed and fitted using special tools (e.g. tool set No. 4521/7 from Hazet, 5630 Remscheid).

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung

After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 E.
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor

Blue	securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520

updraft air-flow sensor

Red	Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254 ..

VDT-I-438/104 En
3.1983
(Replaces Ed. 5.1982)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal
0 580 254 001	1 587 010 500	---	---
002	500	---	---
0 580 254 003	502	---	---
004	502	---	---
005	502	---	---
006	502	---	---
007	500	---	---
948	005	---	---
949	002	---	---
950	006	---	---
951	006	---	---
952	002	---	---
953	501	---	---
954	002	---	---
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960	002	---	---
961	002	---	---
962	002	---	---
963	005	---	---

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Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 964	1 587 010 002	---	---
965	002	---	---
966	002	---	---
967	002	---	---
968	002	---	---
969	002	---	---
970	002	---	---
971	002	---	---
972	002	---	---
973	002	---	---
974	002	---	---
975	003 ④	---	---
976	004 ③	---	---
977	004 ③	---	---
978	1 587 410 901	---	---
979	010 004 ③	---	---
980	002	---	---
981	002	---	---
982 ①	003 ④	---	---
982 ②	1 587 410 901	---	---
984	010 004 ③	---	---
985	---	1 583 385 006	1 580 203 002
986	---	386 011	001
987	---	008	001
988	---	008	001
989	---	008	001
990	---	385 004	002
991	---	004	002
992	1 587 010 001	---	---
996	---	386 011	001
998	---	385 004	002
9 580 234 003	002	---	---
005	002	---	---

1 = up to FD 822 2 = from FD 823

3 = Parts set ..003 also possible (delivery-line connection at 90°)

4 = Parts set ..004 also possible (delivery-line connection axial)

After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

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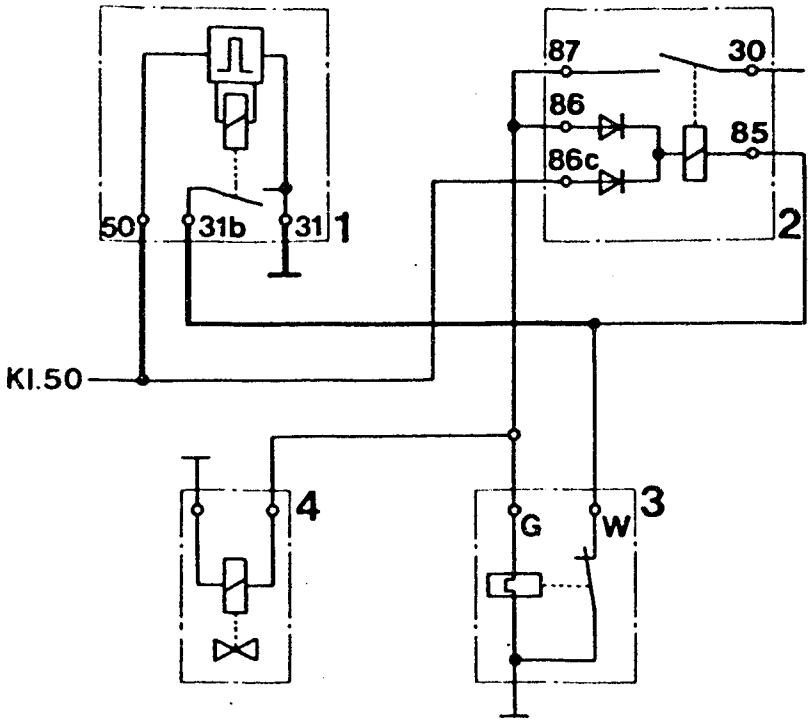
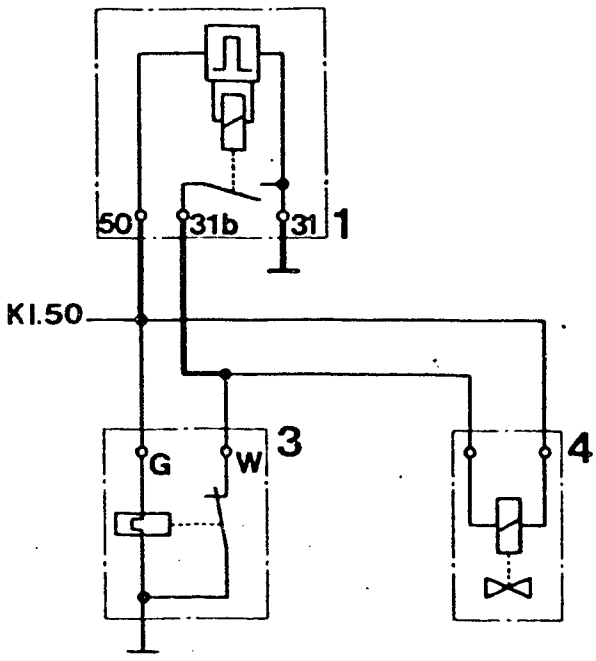


K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Motor Vehicle Service Information

EXPORT VEHICLES WITH
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.
12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	●	●	●	(●)	(●)
Secondary-air induction*	●	●	●	(●)	(●)
Secondary-air injection*	●	●	●	(●)	(●)
Catalytic converter*	-	-	-	●	●
Lambda closed-loop control	-	-	-	●	●

The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

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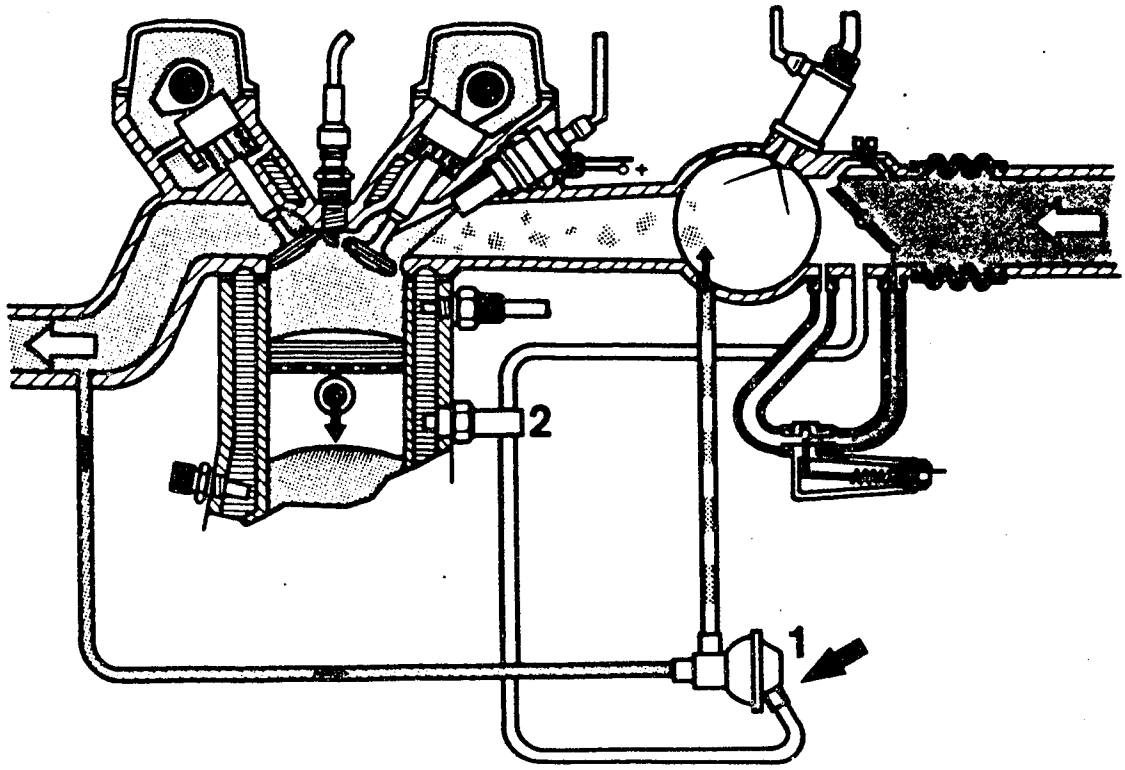
1. Exhaust-gas recirculation (EGR)



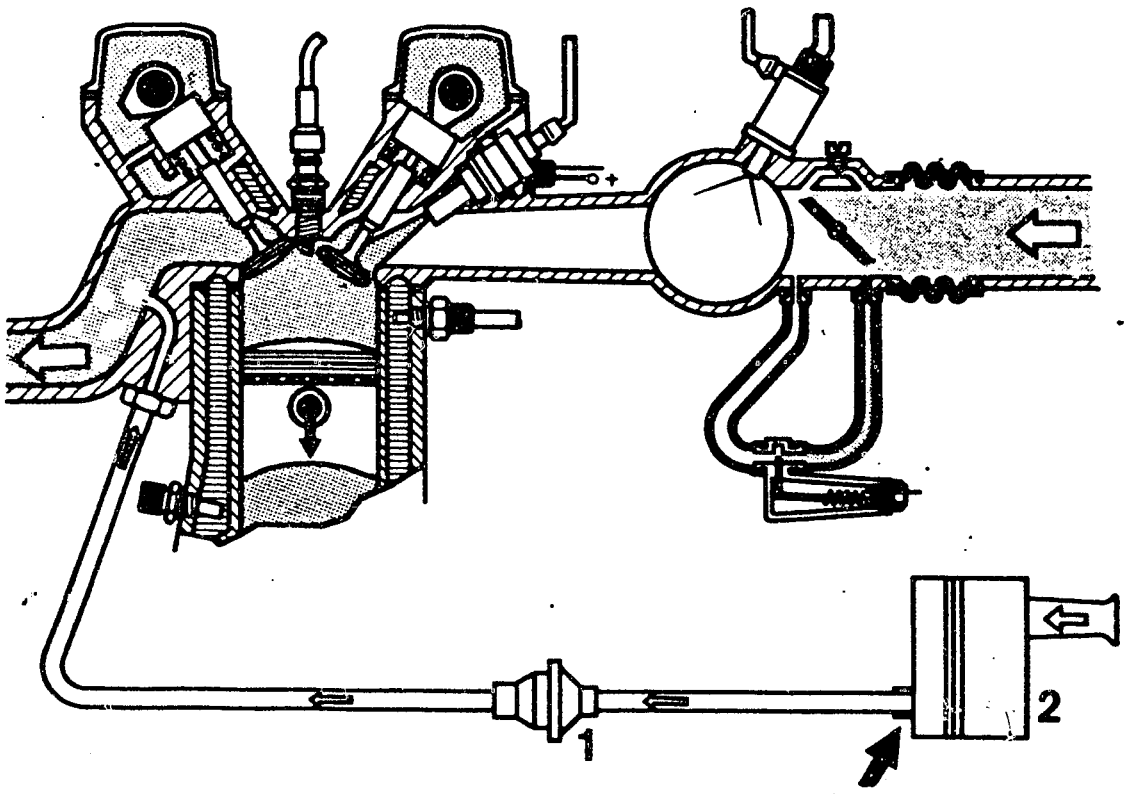
1 = Exhaust-gas recirculation valve 2 = Thermo-valve

Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NOx). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min^{-1}. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.

2. Secondary-air induction (e.g. Volvo Pulsair system)



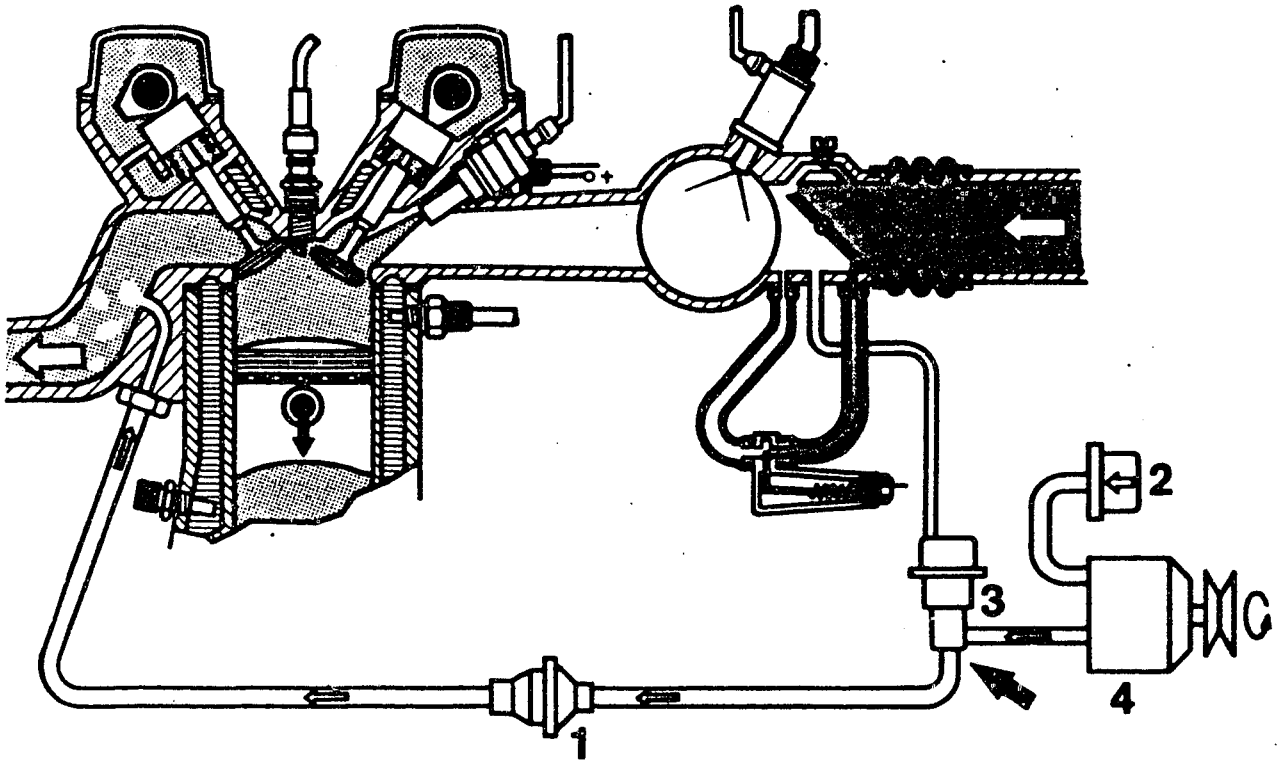
1 = Non-return valve 2 = Air filter

The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed, and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.

3. Secondary-air injection



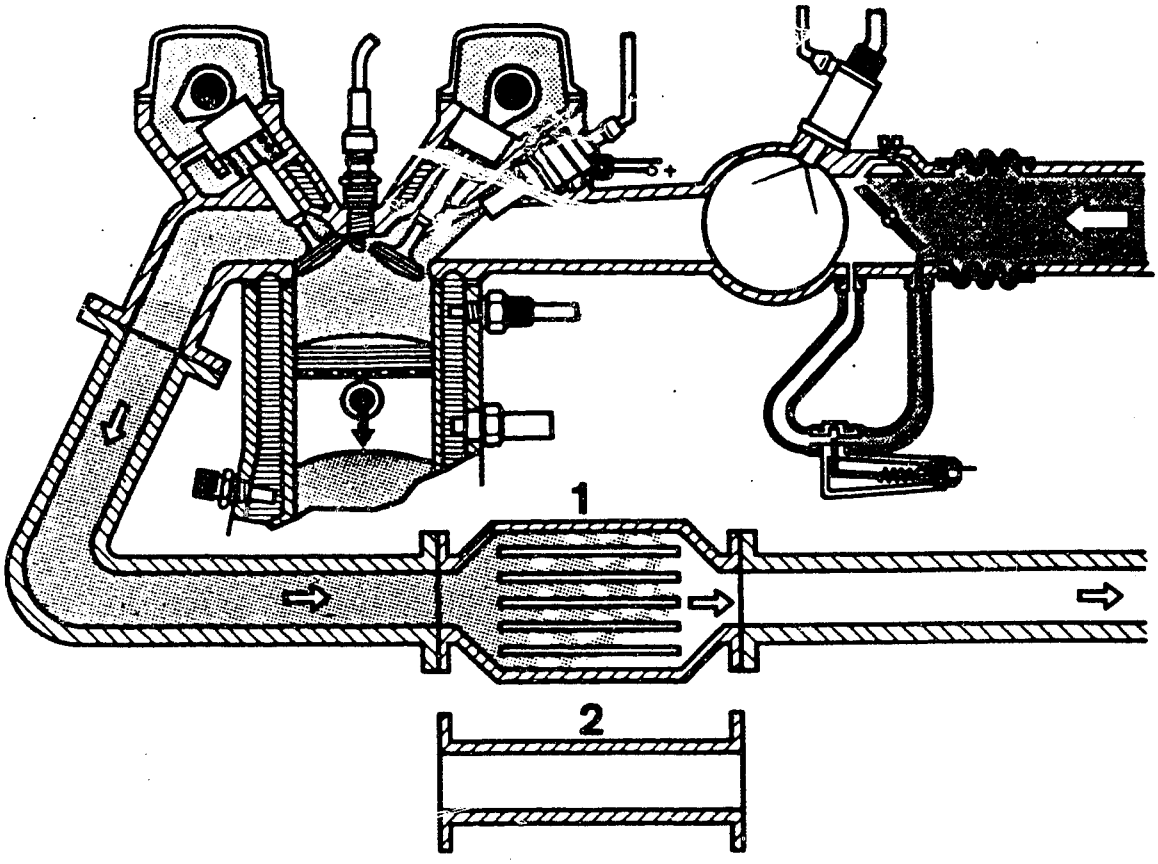
1 = Non-return valve
2 = Air filter
3 = Change-over valve
4 = Air pump

An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.

4. Catalytic converter



1 = Catalytic converter 2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.
Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

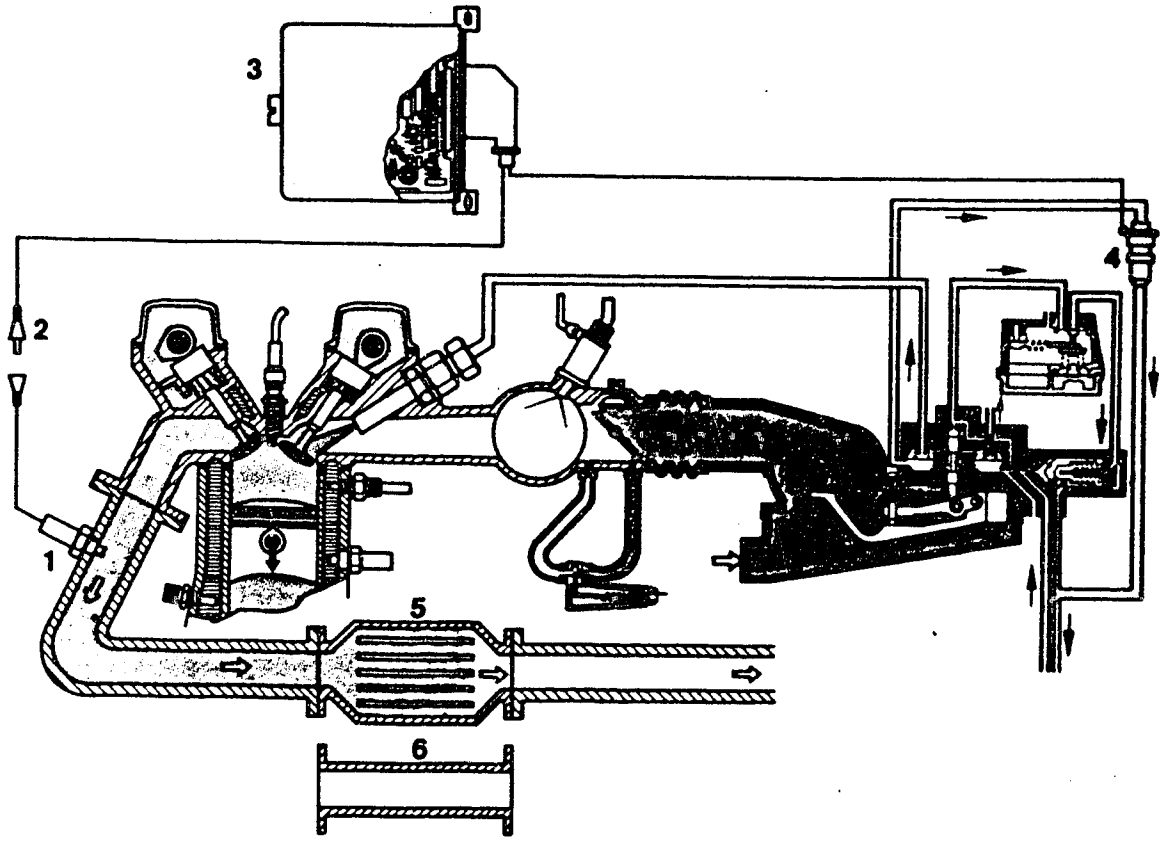
When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.

5. Lambda closed-loop control



1 = Lambda sensor
2 = Plug
3 = Control unit
4 = Timing valve
5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.
If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!
Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.
The catalytic converter should be replaced by an intermediate pipe.

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After-sales Service

Motor Vehicle Service Information

HOT-STARTING PROBLEMS

on vehicles fitted with Jetronic

VDT-I-Gen. 050 En
9.1982

Customer complaints

If the vehicle is parked and the engine switched off after having been run at normal operating temperature, it often occurs that the engine proves difficult to start, or won't start at all, and when it does start it runs extremely roughly (only on 2 or 3 cylinders). The engine has to be accelerated a number of times before it runs smoothly.

Causes

For economic reasons ("stretching" of the mineral-oil reserves), it can happen that alcohol in varying quantities has been added to gasoline. Methanol is used for instance.
Such alcohol-added fuels, depending upon the amount of alcohol, adversely affect the hot-starting characteristics of the engine. The addition of alcohol raises the vapor pressure of the fuel and the result is that the boiling point of the alcohol-fuel mixture drops. This in turn leads to the formation of fuel-vapor locks in the fuel system when the engine has been switched off.

This means that when starting, and during the subsequent idle period, the air-fuel mixture is temporarily too lean.

Remedies

- Check the ignition and Jetronic systems, particularly for leaks.
- Changing to another brand of gasoline can sometimes cure the problem immediately.
- In many cases, fully depressing the gas pedal helps during starting, as does slightly depressing the gas pedal during the idle period until the engine runs smoothly.
- Fit the pulse relay 0 340 000 003 (refer also to VDT-I-438/105) in vehicles with K and D-Jetronic.
  This step, though, will still not fully alleviate the rough running of the engine during the starting off phase

Note:

The pulse relay 0 340 000 003 is NOT to be installed in vehicles fitted with L-Jetronic.

Please direct questions and comments concerning the contents to our authorized representative in your country.

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After-sales Service

Motor Vehicle Service Information

COLD START - WARM UP
ACCELERATION PROBLEMS

VDT-I-Gen. 051 En
10.1982

in vehicles with Jetronic

Customer complaints

- Starting problems with a cold engine
- Engine bucking during warm up
- Uneven idle (speed fluctuations)
- Engine cuts out during acceleration (flat spot)
- Loss of output

Cause

When the ignition and the Jetronic have been checked and the test specifications given have been reached, a possible reason for the problems quoted could be coke residue on the intake valves.

The carbon residue thus present delays a continuous flow of fuel from the injection valve to the combustion chamber on account of its sponge effect.

As a result of this the air-fuel mixture can in some cases be so lean, that it can no longer be ignited.

Loss of output results from a reduction in the amount of cylinder filling and is caused by a very high coking.

Complex connections between qualities specific to the engine, the engine oil and fuel used, as well as relevant driving cycles (e.g. mainly short stretches) can cause such coking on the intake valves.

Remedy

Dismantle the intake valves and remove the deposits.

Please note

Various vehicle manufacturers are working at the moment on other measures, such as cleaning with additives. Results of these tests are not yet available.

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After-sales Service

Motor Vehicle Service Information

LIQUID PETROLEUM GAS (AUTOGAS) SYSTEMS AND VEHICLES WITH K-JETRONIC

VDT-I-Gen. 052 En
10.1982

Fitting at a later stage

Vehicles with K or L-Jetronic are not suitable for fitting at a later stage with liquid petroleum gas (LPG) systems.

Numerous problems can occur, such as:

- Reduction of fuel flow through the injection valves due to deposits
- Stiffness or blocking of the K-Jetronic fuel distributor plunger (due to gumming or similar) in the course of time with "gas only operation."
- Increased danger of backfiring in the intake manifold (burbling) and thereby damage to the air-flow sensor.

Guarantee

Guarantee claims for failed Jetronic components from vehicles thus converted will not be accepted.

Conversion to liquid gas operation is made at the risk of the vehicle owner.

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